



Charles E. Kellogg

Canadian Journal

CANADIAN JOURNAL

In the early spring of 1951, Dr. John Mitchell
of the University of Saskatchewan requested the
Department of Agriculture that I spend some time in
CHARLES E. KELLOGG
the summer of 1951 and would be concerned with
land problems in the northern parts of Saskatchewan
and Alberta in order to advise with them on the classi-
fication of the soils and the suitability of marginal
areas for agricultural settlement and forestry. Because
of the similarities of many of the soils to important
ones in the United States, it was decided that I should
make the trip.

This Journal is a record of notes taken on the
spot, often in some haste. Likely there are errors.
Some of the entries **1951** at the time may be changed
with further information and reflection. These notes
are not to be quoted except with permission in writing.

Canadian Journal

1950

In the early spring of 1951, Dr. John Mitchell of the University of Saskatchewan requested the Department of Agriculture that I spend some time in the summer with his staff and others concerned with land problems in the northern parts of Saskatchewan and Alberta in order to advise with them on the classification of the soils and the suitability of marginal areas for agricultural settlement and forestry. Because of the similarities of many of the soils to important ones in the United States, it was decided that I should make the trip.

This Journal is a record of notes taken on the spot, often in some haste. Likely there are errors. Some of the opinions formed at the time may be changed with further information and reflection. These notes are not to be quoted except with permission in writing.

August 18

I leave Washington for Regina at 5:30 P. M.

August 19

I change trains in Chicago in the morning and
again in St. Paul in the afternoon.



August 20

I am up just in time to get breakfast in a tiny, slow, and crowded diner. We cross the border into Canada about 6:00 A. M. I change depots in Winnipeg and leave on the Canadian Pacific Railway for Regina at 10:30 A. M. The station is rather large but crowded. There is a large group of recent immigrants from Europe, with many children, which I suspect may have come from the Baltic area. I get off the train in Regina at 6:50 P. M. and meet with Dr. John Mitchell and Mr. H. C. Moss. Mr. Moss is the senior soil scientist from the Dominion staff working in Saskatchewan.

After being established in my room I join Mitchell and Moss in their room for an initial conference that includes Mr. E. E. Brockelbank, Director of Animal Industries in the Provincial Department of Agriculture, and Mr. T. H. Freeman, Director of Assessments, Provincial Department of Municipal Affairs.

August 21

I have a breakfast conference with Mr. Sissons, a reporter for the Regina paper. We pack and leave for the field about 9:50. We can only make a few soil examinations since the plans call for reaching Saskatoon this evening. We drive out north of Regina on highway #6. Regina lies in a great lacustrine plain. I see the Regina heavy clay, a Chestnut soil, about eight miles north of Regina. I look at the soil in a road cut.

A ₁₁	0 - 2 $\frac{1}{2}$ "	Nearly black, medium granular clay; pH - 8.0. <u>1</u> /
A ₁₂	2 $\frac{1}{2}$ - 9 $\frac{1}{2}$ "	Nearly black (10YR 2/1) clay; weak, coarse prismatic and moderate blocky structure. When rubbed the color changes to very dark brown (10YR 2/2); pH - 7.0.
B	9 $\frac{1}{2}$ - 30"	Very dark grayish-brown (2.5Y 3/2) coarsely prismatic firm clay, friable only with difficulty; pH - 8.0.
C	30 - 36"	Less well-defined prismatic structure. The color is like that above with some trend toward olive.

1/ pH determinations with Truog-Hellige field kit.

August 21

I have a breakfast conference with Mr. Stinson, a reporter for the Regina paper. We pack and leave for the field about 9:50. We can only make a few soil examinations since the place call for reaching Saskatoon this evening. We drive out north of Regina on highway #6. Regina lies in a great lacustrine plain. I see the Regina heavy clay, a Chestnut soil, about eight miles north of Regina. I look at the soil in a road cut.

0 - 2 1/2"	AI1	Nearly black, medium granular clay; pH - 8.0-8.1
2 1/2 - 2 3/4"	AI2	Nearly black (10YR 2/1) clay; weak, coarse prismatic and moderate blocky structure. When rubbed the color changes to very dark brown (10YR 2/2); pH - 7.0.
2 3/4 - 30"	B	Very dark grayish-brown (2.5Y 3/2) coarsely prismatic firm clay, friable only with difficulty; pH - 8.0.
30 - 36"	C	Less well-defined prismatic structure. The color is like that above with some trend toward olive.

✓ pH determinations with Troop-Kellogg field kit.

The soil effervesces with acid in the 2 and 3 feet
to the surface. It is level to undulating and the lower
3 is said to have well-defined varves. The soil is
moderately well drained, one class below normal.

Native

The soil

tree

highly

fertil

nature

tilled

blowing

and I

a Chest



farmer comes over and I have a short talk with him.

He comes in a general place.

Canada. 8 miles north of Regina, Saskatchewan.

but he Well-prepared summer fallow on Regina heavy clay --

a Chestnut soil grading toward chernozemic Wiesenboden.

pounds to the acre of an 11-18-0 fertilizer with the

wheat when needed. Farmers here always use summer

fallow. This field was lightly tilled in the autumn

The soil effervesces with acid in the C but not in the solum. It is level to undulating and the lower C is said to have well-defined varves. The soil is moderately well drained, one class below normal. Native vegetation is said to have been mixed prairie. The soil is used mostly for small grains. A few low trees grow with difficulty. Although the soil is not highly deficient, farmers get good response to phosphatic fertilizers. Upon exposure with cultivation the surface naturally granulates; thus, care must be taken in tillage to maintain clods and trash to avoid soil blowing.

It seems to me that this soil is a bit dark for a Chestnut and rather close to chernozemic Wiesenboden.

I take some pictures of the summer fallow. The farmer comes over and I have a short talk with him. He came originally from Illinois several years ago, but has not become a Canadian citizen. He uses 50 pounds to the acre of an 11-46-0 fertilizer with the wheat when seeded. Farmers here always use summer fallow. This field was lightly tilled in the autumn

with a discer (somewhat smaller than a one-way), harrowed in the spring, and finally worked with a tiller. He has cultivated and harrowed twice during the summer to kill weeds. He has done a good job in maintaining clods and trash in the surface. Some neighboring farmers, who had been careless in tillage, will get serious soil blowing with drought. We drive on north and are soon out of the old lake plain into the "knob-and-kettle" till plain. One sees many small moderately eroded knolls and small brush-covered pot-holes or sloughs, locally called "bluffs." The soil still belongs in the Chestnut group. According to Mitchell the C_{ca} is about 12 to 15% calcium carbonate and the C about 10%. The normal soil is called Weyburn loam and the whole collection is called the Weyburn association.

We drive across the Qu'appelle Valley, which is an old glacial drainage channel, and are again in the "knob-and-kettle" till plain.

We stop at Southey for lunch and then continue north.

L-3013 August 21, 1951
Canada, 21 miles north of Southey, Saskatchewan.
Chestnut soil in "knob-and-kettle" till plain.
Another view.



K-2042 August 21, 1951
Canada. 21 miles north of Regina, Saskatchewan.
Chestnut soil on "knoll and kettle" till plain.

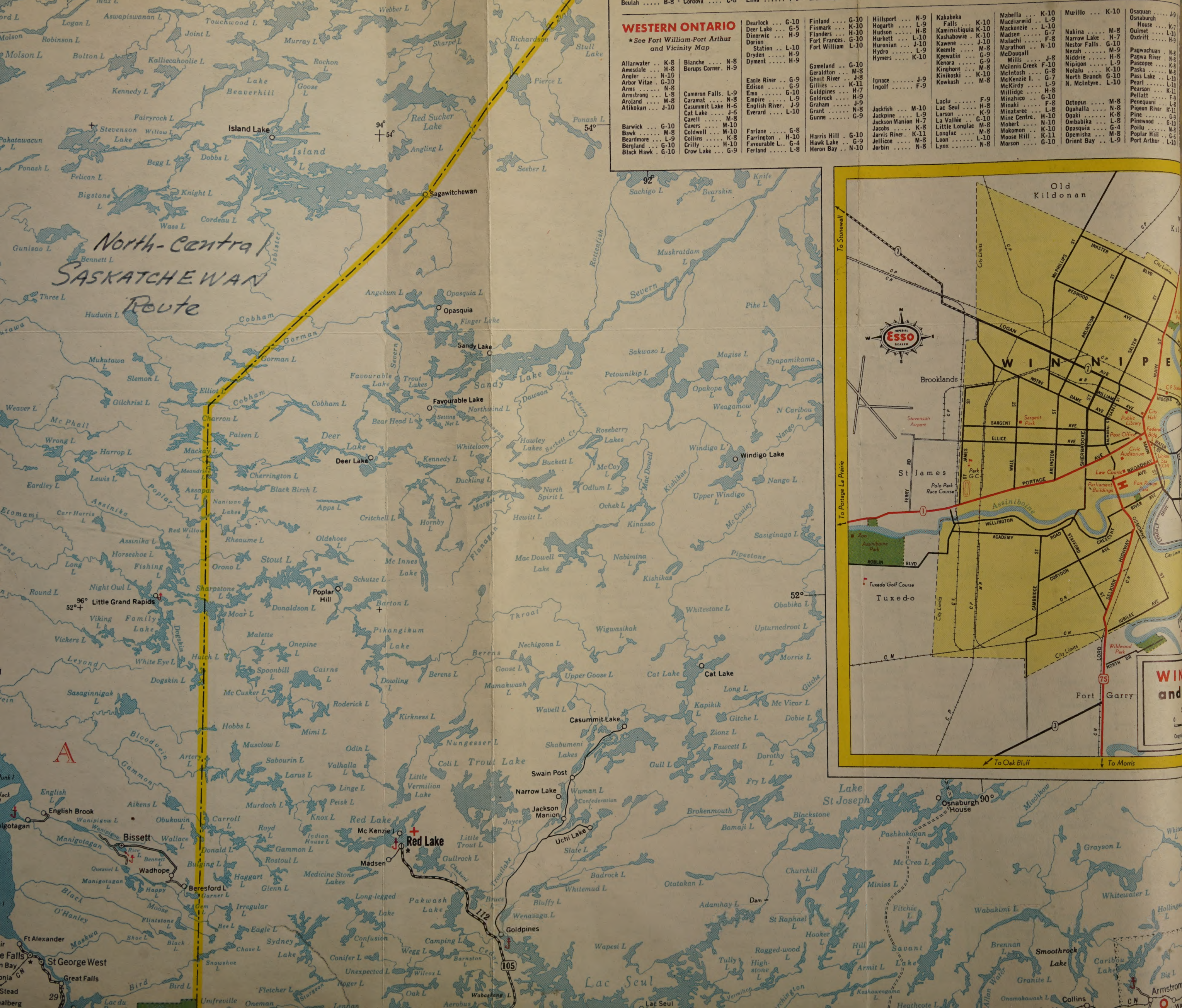


K-2043 August 21, 1951
Canada. 21 miles north of Regina, Saskatchewan.
Chestnut soil on "knoll and kettle" till plain.
Another view.



K-2044 August 21, 1951
Canada. 21 miles north of Regina, Saskatchewan.
Chestnut soil on "knoll and kettle" till plain.
Another view.





WESTERN ONTARIO

* See Fort William-Port Arthur and Vicinity Map

Allanwater ... K-8	Blanche ... N-8
Amesdale ... H-8	Burpus Corner ... H-9
Angler ... N-10	
Arbor Vitae ... G-10	
Arms ... N-8	
Armstrong ... L-8	
Aroland ... M-8	
Atikokan ... J-10	
Barwick ... G-10	
Bark ... M-8	
Beardmore ... L-9	
Berland ... G-10	
Black Hawk ... G-10	
Cameron Falls ... L-9	
Caramat ... N-8	
Casummit Lake ... H-6	
Cat Lake ... J-6	
Cavell ... M-8	
Coldwell ... M-10	
Collins ... K-8	
Crilly ... H-10	
Crow Lake ... G-9	
Dearlock ... G-10	
Deer Lake ... G-5	
Dinorwic ... H-9	
Dorion ... L-10	
Dryden ... H-9	
Dymert ... H-9	
Eagle River ... G-9	
Edison ... G-9	
Emo ... G-10	
Empire ... L-9	
English River ... J-9	
Everard ... L-10	
Farlane ... G-8	
Farrington ... H-10	
Favourable ... G-4	
Ferland ... L-8	
Finland ... G-10	
Finmark ... K-10	
Flanders ... H-10	
Fort Frances ... G-10	
Fort William ... L-10	
Gameland ... G-10	
Geraldton ... M-8	
Ghost River ... J-8	
Gillies ... K-11	
Gillies ... H-7	
Goldpines ... H-9	
Goldrock ... H-9	
Graham ... J-9	
Grant ... N-8	
Gunn ... G-9	
Harris Hill ... G-10	
Hawk Lake ... G-9	
Heron Bay ... N-10	
Hillsport ... N-9	
Hogarth ... L-9	
Hudson ... H-8	
Hurkett ... L-10	
Huronian ... J-10	
Hydro ... L-9	
Hymers ... K-10	
Ignace ... J-9	
Ingolf ... F-9	
Jackfish ... M-10	
Jackpine ... L-9	
Jackson Manion ... H-7	
Jacobs ... K-8	
Jarvis River ... K-11	
Jellicoe ... M-8	
Jorbin ... N-8	
Kakabeka Falls ... K-10	
Kaministiquia ... K-10	
Kashabowie ... K-10	
Kawene ... M-8	
Keewatin ... G-9	
Kenora ... G-9	
Kingham ... M-8	
Kivikoski ... K-10	
Kowkash ... M-8	
Laclu ... F-9	
Lac Seul ... H-8	
Larson ... K-9	
La Vallée ... G-10	
Little Longlac ... M-8	
Longlac ... M-8	
Loon ... L-10	
Lynx ... N-8	
Macabeka ... K-10	
Macdunn ... L-9	
MacKenzie ... L-10	
Madson ... F-8	
Malachi ... G-7	
Marathon ... N-10	
McDougall ... J-8	
Mills ... F-10	
McIntosh ... G-8	
McKenzie ... L-9	
McKirdy ... H-8	
Millidge ... G-10	
Minako ... F-9	
Minaki ... L-8	
Minataree ... L-8	
Mine Centre ... H-10	
Mober ... N-10	
Mokomon ... K-10	
Moose Hill ... K-11	
Morson ... G-10	
Murillo ... K-10	
Nakina ... M-8	
Narrow Lake ... H-7	
Nestor Falls ... G-10	
Nezah ... M-9	
Niddrie ... H-8	
Nipigon ... L-9	
Notale ... K-10	
North Branch ... G-10	
N. McIntyre ... L-10	
Octopus ... M-8	
Ogahalla ... N-8	
Ogaki ... K-8	
Ombabika ... L-8	
Opasquia ... G-4	
Opemisha ... M-8	
Orient Bay ... L-9	
Osagan ... J-9	
Osnaburgh House ... K-7	
Oumet ... L-10	
Oxdrift ... H-9	
Pagwachuan ... N-8	
Pakwa River ... N-8	
Pascopee ... K-8	
Paska ... M-8	
Pass Lake ... L-10	
Pearl ... L-10	
Pellatt ... F-9	
Penequani ... L-8	
Pigeon River ... K-11	
Pine ... G-9	
Pinebow ... G-10	
Poilu ... M-8	
Poplar Hill ... G-6	
Port Arthur ... L-10	



About a mile north of Raymore, I look at a degraded Chernozem under aspen. The nearby upland soil is called "Black" or calcareous Chernozem and is about 6 to 8 inches deep; the till is highly calcareous. Where I look at the soil it has developed under second growth aspen on a gentle slope. (The aspen in this country may have increased greatly during the past fifty years because of the control of prairie fires.)

- | | |
|----------------------------------|---|
| A ₀ 2 - 0" | Very dark reddish-brown to nearly black finely granular mull, held together by few roots in a soft mat. |
| A ₁ | Absent. |
| A ₂ 0 - 3" | Light brownish-gray (10YR 6/2) loam to clay loam, finely mottled with brown. Strong, medium platy structure; brittle; vesicular. |
| A-B 3 - 4" | Transitional. |
| B ₂ 4 - 12" | Mottled dark brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) clay. Strong medium blocky structure and weak prismatic; fairly friable. |
| C _{ca} 12 - 24" (Appx.) | Grayish-brown (2.5Y 5/2), mottled with white, friable silty clay. Strong medium and fine blocky structure in place. Easily friable and very limy. |

C 24 - 30" / As above, but gradually fading in color with depth.

The plant roots extend into the C_{ca}.

Here we are very close to the boundary between the Chestnut and Chernozem. Nearby I see a well-developed Chestnut soil similar to the Williams near Mandan, North Dakota.

About three miles north of Raymore I looked at a "depression Podzol," in weakly developed Chernozem near the boundary with Chestnut. Here the A₂ is very light gray, strongly platy, and very friable. The upper part of the B, B₁, is medium gray, mottled with reddish-brown and fairly well granulated. This is only about two inches thick and gives way to the B₂ which is a tough clay with weak prismatic structure. The soil is dark gray, mottled with brown. At about 20 to 24 inches one goes through the B into less hard clay of medium gray color mottled with yellowish-brown. The pH of the A₂ is 6.0 and that of the B₁ is 5.8.

These soils are a puzzle. One suspects podzolization, solodization, and gleying, all going on together. Taken by itself, the profile also suggests Planosol. Where at

least moderately well drained, these spots are easily reclaimed by heavy treatment with manure. Fertilizer alone is not enough. We drive on north toward Big Quill Lake where we turn west. Just before Dafoe and for some distance west we pass over a large plain of saline soils.

The afternoon goes fast and we drive on to Saskatchewan over a rough gravel road. I see a great deal of the "knob-and-kettle" till plain, in places mixed with outwash and with saline soils. Then late to bed.

It is about 7:00 P. M. when we arrive at Saskatoon. After a little chit-chat with the Mitchells I go to bed with a very sore shoulder.

August 22

I go out to the University of Saskatchewan with Dr. Mitchell. First we make final arrangements for the remainder of the itinerary, and then discuss soil survey work. I look over the various laboratories and discuss the current research programs with the staff members.

In the evening I meet several people at a reception in Dr. Mitchell's home. Then late to bed.

On stable he advises ammonium nitrate, much superior to ammonium sulphate. He says that plowing under the straw and stubble induces phosphorus deficiency. (I first heard this suggestion a few years ago from Dr. Pierre)

After lunch I buy a knife to replace the one I lost day before yesterday and rubbers for those I forgot to bring. After a short session on soil classification again, we drive out east of Saskatoon on the Klondike soil association. The normal soil is Chestnut and the low spots are saline. The pattern is quite irregular. The Chestnut soils have very

August 23

In the morning I discuss the soil survey and fertilizer research programs with Dr. Mitchell and the staff. He emphasizes the superiority of ammonium phosphate as a phosphate carrier. He thinks that much of the response of crops in the Province to ammonium phosphate is due to its superiority as a phosphate carrier rather than to the nitrogen. He says that they get little response to nitrogen on summer fallow. On stubble he advises ammonium nitrate, much superior to ammonium sulphate. He says that plowing under the straw and stubble induces phosphorus deficiency. (I first heard this suggestion a few years ago from Dr. Pierre)

After lunch I buy a knife to replace the one I lost day before yesterday and rubbers for those I forgot to bring. After a short session on soil classification again, we drive out east of Saskatoon on the Elstow soil association. The normal soil is Chestnut and the low spots are saline. The pattern is quite irregular. The Chestnut soils have very

dark brown granular A horizons with weakly solonchized,
very strongly prismatic, dark reddish-brown B horizons.
In places, one sees suggestions of the A_2 of the solonchized-
solonchized. In some of these places the B has columnar
structure.



K-2045 August 23, 1951
Canada. 4 miles east of Saskatoon, Saskatchewan.
Elstow soil association: Chestnut soil with salt
influence in low places.

dark brown granular A horizons with weakly solonized, very strongly prismatic, dark reddish-brown B horizons. In places, one sees suggestions of the A_2 of the solodized-Solonetz. In some of these places the B has columnar structure.

On the upper slopes of the low knolls, the soil is thin and black. It resembles a thin Chernozem rather than a Chestnut. Moss seems to interpret this in terms of slope and aspect, but to me it is here clearly related to a large excess of calcium carbonate. Thus, these soils are Rendzina-Chernozem, although the thinness could be due a little to somewhat greater natural erosion.

As in other till plains the soil material in the low places is partly formed by accumulation of local wash. The sola are thicker and not derived perhaps directly from the original till. Moss is inclined to separate these soils simply on the basis that the original material is non-till; but I believe that cuts the units too thinly. After all, in most soil landscapes from residual materials, a large part of the actual soil area is ordinarily from such local alluvium, not from material lying in place. The Cecil is a good example.

Later in the afternoon we have a long talk about the next step in the soil survey program in Saskatchewan. I suggest that they plan a detailed soil survey program linked closely to the agricultural advisory work. I suggest that the soil survey parties could map experimental farms and especially farms that keep accurate records. These could serve as a basis for training-schools for advisory officers and farm leaders. I suggest that the field work could be done on aerial photographs at 3 to 4 inches to the mile and the maps published at 2 inches to the mile.

Early to bed.

We pass the interglacial salt lake, Muskeg, east of Vanda. A few miles west of Falda I take a picture of new land breaking on thin Chernozem from highly calcareous glacial drift. The A_1 horizons are naturally very thin on the sharp knolls and become thinner with tillage.

August 24

We leave Saskatoon for a field trip into north Saskatchewan. The party includes Moss, Mitchell, Johnson, Hutcheon, and Ellis. We go north and east on highways 27 and 5, past Vonda. Most of this land is used for wheat, which is now nearly ready for harvest. Actually there is too high a proportion of the soil in wheat. With less wheat and more barley and oats, systems of mixed farming could be developed that would make better use of the knobby and stony land, which is suited only to grazing. We pass over the old lake plain on to the knobby till plain. The many little kettle holes have low trees and brush in them.

We pass the intermittent salt lake, Muskiki, east of Vonda. A few miles west of Fulda I take a picture of new land breaking on thin Chernozem from highly calcareous glacial drift. The A_1 horizons are naturally very thin on the sharp knolls and become thinner with tillage.

P-V

Along the road south of Lake Lenore are beautiful
Sheridan soils. The calcareous surface is nearly
black for 2 1/2 inches and underlain by yellowish loam.
The soils are softly granular.



K-2046 August 24, 1951
Canada. East of Vonda, Saskatchewan. View of Lake
Muskiki -- a salty lake with mirror surface.

4, About 1/4 inch.

4, 11 0 - 2 1/2"

Strong coarsely granular very
dark brown loam. Highly stratified
with gravelly sandy rocks.

Along the road south of Lake Lenore are beautiful Chernozem soils. The calcareous surface is nearly black for 2 1/4 inches and underlain by yellowish loam. The soils are softly granular.

We stop for lunch at Lake Lenore. A little way north I look at a nice Chernozem (Naicam series). The surface 11 to 12 inches is finely and softly granular loam with much fine sand. The color fades through a transitional B to brownish-yellow till. The C_{ca} is not highly conspicuous. The wheat crop is excellent. The poplar trees and other low trees along the fences suggest a somewhat well-watered country for Chernozem. Right here there are not so many of the low wet spots; yet there are a few, with degraded soils.

A bit further on, I look at the soil in a grove of aspen. The pH runs about 6.5 in the upper horizons.

A₀ About 1/4 inch.

A₁₁ 0 - 2 1/2" Strong coarsely granular very dark brown loam. Highly streaked with mycelium; many roots.



K-2047 August 24, 1951
 Canada. North of Naican, near Pleasantdale, Saskatchewan. New clearing on Shellbrook (fine sandy loam).
 Note patches with gray leached surface soil.



K-2048 August 24, 1951
 Canada. North of Naican, near Pleasantdale. Characteristic farmstead.

- A₁₂ 2 $\frac{1}{2}$ - 11" Very dark gray to black loam
with weak coarse blocky structure.
Shortly after we Easily friable to soft fine granular.
- B₃ 11 - 14" Transitional.
- C 14" / Pale brown silty drift somewhat
mottled with gray. Vesicular; massive
but easily friable.

Near Pleasantdale I stop a moment to take a picture
of a new clearing of a Shellbroke soil. The clearing
exposed some patches of degraded soil. I see some
more of this degraded Chernozem from clayey till south
of Melfort.

We are graciously received at the Commercial Hotel
in Melfort at 6:30 P. M. Then dinner, a little chit-chat,
and early to bed.

- B₃ - C_{oa} 15 - 30" Dark brown grayish soil like
above but a little lighter in
color. Gradually fading to
- C 30" / Light brown varved calcareous clay.

It continues to rain fairly hard. A little further
east we stop to look at the soil under natural exposure.
It is gently undulating. The drainage is moderately

August 25

Shortly after we get up it begins to rain. We wait for a while but apparently rain is expected all day, so we leave about 9:15. Just east of Melfort we stop to look at the Melfort silty clay despite the rain. The land is very gently undulating to undulating. There are some small trees and shrubs. Most of the soil is used for small grains and a little of it for potatoes and peas.

- | | | |
|----------------------------------|----------|--|
| A ₁ | 0 - 12" | Nearly black well-granulated silty clay loam with excellent root development. |
| A - B | 12 - 18" | Dark grayish-brown coarse to medium blocky soil that is roughly prismatic. Firm and tough. Friable only with difficulty now that the soil is fairly dry. |
| B ₃ - C _{ca} | 18 - 30" | Dark brown grayish soil like above but a little lighter in color. Gradually fading to |
| C | 30" / | Light brown varved calcareous clay. |

It continues to rain fairly hard. A little further east we stop to look at the soil under mature aspen. It is gently undulating. The drainage is moderately

good to good. This is an excellent soil for small grains but, of course, clearing is necessary here where little was needed on the Melfort silty clay at the last stop.

- A₁ 0 - 4" Reddish-black (2.5YR 2/1) silty clay loam with some very fine sand. The soil digs out in firm brittle chunks that are easily friable to soft fine crumb; many roots.
- A₂ 4 - 9" Very dark grayish-brown (10YR 3/2) silty clay loam mottled with shades. Weak coarse blocky structure with strong evidence of platy. Easily friable; many roots.
- B 9 - 24" Dark grayish-brown (10YR 4/2), faintly mottled with brown, weak coarse blocky that falls to easily friable medium fine angular blocky which goes in turn to medium granular.
- C_{ca} and C 24" / Grayish-brown clayey lacustrine material mottled with gray. Firm in place but fairly easily friable. The soil is finely mottled with light gray in the upper part. This fades with depth.

We go on through Tisdale and turn north. In the hard rain we look at a degraded Chernozem under a medium stand of aspen on a gently undulating lake plain of clay.

- A₁ 0 - 2" Very dark brown (10YR 2/2) finely and softly granular clay or clay loam; heavy root mat.
- A₂ 2 - 7" Mottling of light gray and light brownish-gray (10YR 7/2 to 6/2) silty clay loam. Very weak coarse prismatic and platy; easily friable.
- A - B 7 - 10" Transitional.
- B₂ 10 - 24" Faintly mottled very dark grayish-brown, dark brown, and brown clay (generally, 10YR 3/2 to 4/3). Strong coarse prismatic, breaking into rough subangular medium blocky. Firm to hard; friable only with difficulty.

We didn't go deeper than this. It appears that this soil is influenced by some solonization.

Nearby we look at a similar and more strongly developed profile. The A₂ is white (5Y 8/1) and has a pH of about 5.2. The upper B is very dark brown clay with strong coarse prismatic structure. The soil is faintly mottled with shades. The lower B, about 20 inches, is very dark brown to black heavy clay that is coarsely prismatic. These clays are very sticky and plastic when wet. This soil is included with the Arborfield.

We stop for lunch at Nipawⁱn. It continues to rain; we drive on to White Fox and turn west.

About two miles west of Garrick we stop to look at a Gray Wooded soil -- Kelsey -- from resorted till. The soil is nearly level.

- A₀ 4 - 0" Dark reddish-brown finely granular turf with many roots (2.5YR 2/2). pH is about 6.0 to 6.5.
- A₁ 0 - 1/2" Dark gray silt loam. Firm in place and easily friable to very fine soft granular.
- A₂ 1/2 - 6" Grayish-brown (10YR 5/2), mottled lightly with brown, heavy silt loam. The structure is weak medium platy; friable; pH is 8.0.
- B 6 - 14" Pale yellow (2.5Y 7/4) to light yellowish-brown (2.5Y 6/4) clay. Very weak coarse blocky that is nearly massive; vesicular; easily friable when removed; pH is 8.0.
- C 15 - 30" Grayish-brown (2.5Y 5/2) fine sandy clay (till). Massive in place but digs out easily in friable weak medium blocky; pH is a little above 8.0.

It rains hard and the roads are becoming very muddy indeed.

We stop at Meath Park for tea and drive on west. Just south of the corner to Prince Albert we stop to look at another wooded calcareous soil. The soil is nearly flat and is developed from shallow lacustrine material over till. There is a fairly heavy stand of aspen.

- A₀₀ 1/2 - 3" Loose leaves.
- A₀ 3 - 0" Nearly black finely granular mull.
- A₁ 0 - 6" Dark gray fine sandy loam. Platy, firm in place but easily friable; pH is about 8.0.
- A - B 6 - 10" Transitional. Effervesces.
- B 10 - 21" Light yellowish-brown (2.5Y 6/4) silty fine sandy loam. This is nearly massive but digs out in easily friable clods; effervesces.
- C 21 - 30" / Grayish-brown silty clay loam mottled with shades; easily friable; calcareous.

It continues to rain as we reach Prince Albert over the muddy roads about 8:00 P. M. I have milk toast and am early to bed.

August 26

I am up early for breakfast on a cool sunny morning. The Canadian boys are a little slow in the morning, something like those in Australia. Just as I leave the hotel I am handed a letter from Washington about a trip to Colombia. It will take some time to answer.

We drive north from Prince Albert. About two miles out we stop on an undulating to gently rolling sandy soil. The solum is fine to loamy fine sand with weak bleaching in the upper part. It has a fairly open stand of jack pine. The soil resembles the old Bibbon sand of Bayfield County, Wisconsin.

I tell my comrades that I should like to get a sample of a typical Gray Wooded soil and that I hope that they don't tell me immediately after we have it that for some reason it isn't quite typical. We shall see how it works out.

We stop to look at a Gray Wooded soil from glacial till 23 miles north of Prince Albert. The till plain has sharp low relief. I first look at the soil in the

woods in a medium relief position where the drainage is good. The cover is aspen, alder, cranberry shrub, black poplar, and white spruce mostly.

Sample I

- A₀₀ 4 $\frac{1}{2}$ - 3 $\frac{1}{2}$ " Brown loose partially decomposed leaves.
- A₀ 3 $\frac{1}{2}$ - 0" Very dark brown (10YR 2/2) matted granular humus soil, very near mull; many roots; pH 7.5. (Dark reddish-brown: 5YR 2/2) 1/
- A₁ 0 - $\frac{1}{2}$ - $\frac{1}{4}$ " Very dark grayish-brown silty very fine sandy loam (10YR 3/2). No regular structure and easily friable to soft fine granular; vesicular and many roots. (Very dark gray: 10YR 4/1)
- A₂ $\frac{1}{2}$ - 12" White (10YR 8/2) mottled with pale brown (10YR 7/2) heavy fine sandy loam. Strong medium platy. The plates are brittle, vesicular, and easily crushed to fine granular; pH 5.8. (10YR 8/2)
- B₁ 12 - 13 $\frac{1}{2}$ 5" Transitional. Horizon is quite irregular; in about half of the 3-foot hole the A₂ rests directly on the B₂.

1/ Color designations in parentheses are of samples of dry soil.

B₂ 13 - 19" Brown to dark brown (7.5YR 4/4),
mottled slightly with yellowish-brown,
sandy clay. Moderate medium blocky;
fairly easily friable; sticky when
wet; pH 6.0. (7.5YR 5/4 to 10YR 5/4)

B₃ 19 - 26" Yellowish-brown light sandy clay
loam (10YR 5/4). Transitional to
the parent material. Weak medium to
coarse prismatic; fairly easily
friable. (10YR 6/4 appx.)

It looks like it will rain any moment and the digging
is so difficult that it doesn't seem wise to go any
deeper so I look at the soil in a nearby road cut,
similar to this profile, but with a somewhat steeper slope --
in an oromorphic position in relation to the first one.
The surface horizons are quite similar.

Sample II

A₁ 0 - $\frac{1}{2}$ "

A₂ $\frac{1}{2}$ - 7" Very pale brown (10YR 7/3) very
fine sandy loam. Moderately
medium platy; easily friable.

B₁ 7 - 10" Transitional. Not sampled.
(10YR 7/2.5)

B₂ 10 - 18" Brown sandy clay loam (7.5YR 7/4).
Slight mottling with a reddish-brown
and yellowish-brown. Moderate medium
blocky. (Yellowish-brown: 10YR 5/4)

C_{ca} 18 - to about 30" Light olive gray (5Y 6/2)
sandy clay till, mottled with white;
firm in place; easily friable when
removed.

C- About 30 - 48" / Olive (5Y 5/3) sandy clay till;
easily friable when removed.
(Pale yellow: 5Y 7/5)

Both profiles have some stones in them, so now I have two samples and I am not sure if either is typical! First we went out into the woods and made a hole. But where we should have come in to the C there was some non-conformity in the till. Before we finished the second profile it had started to rain hard again. I try to take photographs but have no hope for them.

We drive on north through Prince Albert Park and have a good view of the bison in the park. We arrive at Waskesiu (equals red deer) about 2:00 P. M. The rain continues hard the rest of the day and the air is cold. I work on my correspondence, chit-chat with my associates, and get early to bed.

August 27

I get up and I am ready to go at 8:30 on a cool rainy unpleasant morning. We wait for a while and then drive out on the north side of Lake Waskesiu. A little way out I stop to look at a Podzol on very sandy till. The surface is undulating. The vegetation includes white birch, white spruce, aspen, and blueberries.

- | | | |
|----------------|---------------------|---|
| A ₀ | 2 - 0" | Very dark brown humus mat. |
| A ₁ | 0 - $\frac{1}{2}$ " | Very dark gray loamy sand; pH 5.2. |
| A ₂ | $\frac{1}{2}$ - 5" | Light brownish-gray (10YR 6/2) loamy sand; pH 5.2. |
| B ₂ | 5 - 8" | Brown (7.5YR 4/4) to dark brown loamy sand; weak orterde; pH 5.5. |
| B ₃ | 8 - 21" | Yellowish-brown, mottled with shades, light sandy loam; firm in place and digs out in angular very friable small clods; pH 6.0. |
| C | 21 - 36" / | Mottled and streaked. Grayish and yellowish soft but firm and friable sandy drift (till). |

Some evidence of gley in the lower part suggests more clayey material beneath.

Near Heart Lake I look at a Gray Wooded soil on gently rolling till under white spruce, white birch, cranberry, and dwarf dogwood.



K-2049 August 27, 1951
Canada. Northeast of Waskesiu, Saskatchewan. View
of cover on sandy Podzol near lake. (Rain)



K-2051 August 28, 1951
Canada. Near Ordale, Saskatchewan. Virgin park vege-
tation on degraded and calcareous Chernozem. Humic-Gley
in lowest places.

- A₀₀ Very thin.
- A₀ Very thin, probably from very recent burn.
- A₁ 0 - $\frac{1}{4}$ " Very dark grayish-brown sandy loam; pH 7.5.
- A₂ $\frac{1}{4}$ - 9" Light brownish-gray (10YR 6/2) light sandy loam; moderate medium platy; pH 5.2.
- A - B 9 - 11" Transitional.
- B₂ 11 - 20" Brown, faintly mottled with grayish-brown and yellowish-brown sandy clay loam; moderate medium blocky; easily friable; pH 5.5.
- (?)
B₃ 20 - 30" Light olive brown sandy loam to sandy clay faintly mottled with brown and yellowish-brown; pH 5.8.

At this point the profile rests on non-conforming sandy drift.

A few yards away I look at a Gray Wooded soil from heavy till, which has well-developed A₂ and B₂ horizons of a micro-Podzol within the fairly sandy A₂. It is not possible for me to determine whether or not this profile has developed wholly from the heavy till. I suspect that the A of the original Gray Wooded may be partly from cover sand over the till. The geology here is very complicated. Within this road cut one finds spots of highly calcareous till only two feet from the surface.

The micro-Podzol within the A₂ of the Gray Wooded is roughly as follows:

- | | | |
|----------------|----------------------|---|
| A ₁ | 0 - $\frac{1}{2}$ " | Dark gray loamy sand. |
| A ₂ | $\frac{1}{2}$ - 4" | Light brownish-gray loamy sand; pH 6.0. |
| B ₂ | 4 - $6\frac{1}{2}$ " | Brown to dark brown light sandy loam with weak orterde; pH 5.2. |
| B ₃ | $6\frac{1}{2}$ - 8" | Transitional. |
| C - | | (of Podzol) This is the A ₂ of the Gray Wooded soil. It is gray loam to silty clay loam, rather compact and firm in place; moderately platy; very easily friable when removed; pH 5.5. |

We drive on back to Waskesiu for lunch. On the way we stop to look at the soil under dense spruce with imperfect drainage. The upper six inches have a fairly loose mat. Beneath is gleyed soil somewhat like the A₂ of the Gray Wooded. In depth there is some brown staining. The soil temperature is 42°F at 18" below the surface.

On leaving the park I get a good look at the bison.

We are back in Prince Albert about 5:00 P. M., very dirty and tired. The evening is nearly clear but very cool.

August 28

We leave Prince Albert about 9:00 on a cool morning. A little way out we look at a gley soil with ten inches of peaty mat. Beneath this is eight inches of very dark gray massive silty very fine sandy loam. Below, to thirty inches, is mottled gray and reddish-yellow light fine sandy loam. We take soil temperatures. At 0 inches, just below the mat, the temperature is 42°F ; it is $39\frac{1}{2}^{\circ}$ at 18 inches, and 38° at 30 inches.

The surface is hummocky. The vegetation is small black spruce and large Labrador-tea with moss on the very surface.

Near Weirdale, ^awest of Prince Albert, I try to get pictures of an unplowed area of Degraded Chernozem and calcareous Chernozem in a complex with Wiesenboden.

Near Mildred I look at the Pelly soil -- a Degraded Chernozem from heavy calcareous, somewhat sorted drift. The yellowish-brown B horizon has very hard coarse prisms where dry.

We have lunch at Spiritwood. Just after lunch I see a most amuzing scene, but I am afraid that I am a bit too late to photograph it. A farmer is coming into



K-2052 August 28, 1951
Canada. Near Ordale, Saskatchewan. Virgin park
vegetation on degraded and calcareous Chernozem.
Humic-Gley in lowest places. Another view.



K-2054 August 28, 1951
Canada. Near Ordale, Saskatchewan. Virgin park
vegetation on degraded and calcareous Chernozem.
Humic-Gley in lowest places. Another view.

town on the muddy roads on a little tractor. Attached to it is a small wagon-like trailer nearly filled with his very fat wife. We drive on west and I get some pictures of new clearings. I look at a Humic-Gley soil, transitional between the old Wiesenboden and Half Bog.

A ₀	10 - 0"	Dark peaty surface.
A ₁	0 - 10"	Very dark gray to black silty clay.
G	10 - 25"	Gray sticky calcareous clay with a few pale brown mottles.
D	25" /	Reddish to yellowish-brown coarse sand.

We go on west to Glaslyn and turn south to gently undulating Gray Wooded soil, fairly well drained and mostly under second growth aspen. It is called Waiteville and is regarded as relatively poor in productivity contrasted to other Gray Wooded soils on less clayey till. It is a bit late for pH tests. Tree roots penetrate the soil. Now the B seems very hard but it is likely more permeable in the moist months. I take a sample.



K-2055 August 28, 1951
Canada. A few miles west of Spiritwood, Saskatchewan.
New clearing in Gray Wooded soil (Dorintosh).



K-2056 August 28, 1951 *Hutcheon*
Canada. Part of the party; Moss right, Ellis left,
and Johnson center left. *Janzen, center right.*



K-2057 August 28, 1951
Canada. Near Spiritwood, Saskatchewan,
Mr. H. C. Moss.



K-2058 August 28, 1951
Canada. Near Robinhood, Saskatchewan. Imperfectly
drained soil between Wiesenboden and Half-Bog.

Firm in place and friable when wet.
Difficulty: hard when dry. (1951)
brownish-grey: 10YR 6/2 to 2.5



K-2059 August 28, 1951
Canada. Near Robinhood, Saskatchewan. Imperfectly
drained soil between Wiesenboden and Half-Bog.

Another view.

Sample III

- A₀₀ Very thin.
- A₀ 2 $\frac{1}{2}$ - 0" Dark brown loose mat with many roots.
(5YR 3/2)
- A₁ Essentially absent; not sampled.
- A₂ $\frac{1}{4}$ - 5" Light gray (10YR 7/2) silt loam
with faint streaking and mottling
of very pale brown; moderate medium
platy; rather firm in place but easily
friable. Waves go down to eight inches.
- A - B 5 - 7" Transitional.
- B₂ 7 - 19" Brown to dark brown (7.5YR 4/2) clay or
sandy clay mottled with shades;
moderate medium to coarse blocky; very
firm in place and friable only with
difficulty; hard when dry. (Light
brownish-gray: 10YR 6/2 to 2.5Y 5/2)
- B₃ 19 - 32" Similar to above but dark to very
dark grayish-brown (2.5Y 4/2 to 3/2)
faintly mottled with near hues; firm
moderate to weak medium blocky. (Light
grayish-brown: 2.5Y 5.5/2)
- C 32 - 36" / Dark grayish-brown to light olive
brown (2.5Y 4/2 to 5/4) heavy
calcareous clay till. Very firm in
place but fairly easily friable when
removed in contrast to the B.
(Light olive gray: 5Y 6/2)

As we drive on south toward North Battleford, we leave
the Gray Wooded soils and come into a complex of Degraded
Chernozem and Chernozem under park land. In the Indian



K-2060 August 28, 1951
Canada. 26 miles north of North Battleford,
Saskatchewan. Virgin park land in Indian
reservation.



K-2061 August 28, 1951
Canada. 26 miles north of North Battleford,
Saskatchewan. Virgin park land in Indian reser-
vation. Another view.

reservation here I try to get some pictures to illustrate distribution of grass and shrubs, but I am afraid that it may be too late.

We reach North Battleford about 7:00 P. M.

In the evening we have a vigorous discussion about the use of "score-card" systems for rating soil productivity. Unfortunately, my companions have not seen some of the errors inherent in this procedure.

About twenty miles west of North Battleford, near Sweetgrass, I look at a dark Chestnut soil called "thin black." The soil has beautiful prismatic structure and seems to me to be identical to that on the little plateau at the experimental station near Mandan, North Dakota.

Here the soil is developed from old alluvium lying over the till. I try to get a picture of the excellent stone line that marks the contact.

We stop in Outlook for tea and then drive on in hard rain west and north along the boundary between Alberta and Saskatchewan to reach Lloydminster at

August 29

We leave North Battleford about 8:55 in light rain.

First we drive over a large farm on the river terrace operated as a part of the Provincial Mental Hospital.

I see excellent vegetables and fruits under irrigation.

Some of the tree fruits show signs of chlorosis. Most of the irrigation is by gravity but sprinklers would probably be better. With them some of the slightly hummocky fine sandy loam could be made productive.

About twenty miles west of North Battleford, near Sweetgrass, I look at a dark Chestnut soil called "thin Black." The soil has beautiful prismatic structure and seems to me to be identical to that on the little plateau at the experimental station near Mandan, North Dakota.

Here the soil is developed from old alluvium lying over the till. I try to get a picture of the excellent stone line that marks the contact.

We stop in Cutknife for tea and then drive on in hard rain west and north along the boundary between Alberta and Saskatchewan to reach Lloydminster at



K-2062 August 29, 1951
 Canada. About 20 miles west of North Battleford,
 near Sweetgrass, Saskatchewan. Stone line of granite
 boulders on old till surface below alluvium, in stream
 cut bank.

2:50 P. M. The town is built directly on the Provincial line. My hotel is in Alberta and Saskatchewan is across the main street. Ladies can go into the beer parlors on the Alberta side but not in the ones on the Saskatchewan side.

A little later W. E. Bowser, Dominion soil scientist in Alberta, and C. F. Bentley of the University soils department at Edmonton join us.

There is a large part of it in shrubs and low trees — cherry, aspen, and the like — because of the vegetation in prairie fires. These trees, appearing here and there, are gradually reducing the carrying capacity of the range.

We have tea in Vermilion and go on west. We are stopped for lack of gas a mile or so west of Leduc. Mr. Bentley gets a ride back to the filling station and soon we are on again in the hard rain.

We come into Edmonton about 11:30. I do some useless shopping for adequate field notes, then go to the hotel and change. About 12:30 we drive out to the University and meet Dr. Newton, head of the

August 30

It still rains. We bid goodbye to Moss and the others from Saskatchewan except for Mitchell, who goes with Bowser, Bentley, and myself west from Lloydminster toward Edmonton.

After a few miles we go through hilly morainic country that is largely unplowed. Originally this area was nearly all grass but now there is a large part of it in shrubs and low trees -- cherry, aspen, and the like -- because of the reduction in prairie fires. These trees, spreading from the low places, are gradually reducing the carrying capacity of the range.

We have tea in Vermilion and go on west. We are stopped for lack of gas a mile or so west of Lavoy. Mr. Bentley gets a ride back to the filling station and soon we are on again in the hard rain.

We come into Edmonton about 3:30. I do some useless shopping for adequate field boots, then go to the hotel and change. About 4:30 we drive out to the University and meet Dr. Newton, head of the

soils department. Mitchell and I have dinner in
his room and are back to the hotel at 10:30, very
tired, wet, and cold.

The grain we saw today looks quite green. Unless
the frost holds off for a couple of weeks, it will

be

about

great

now

area,

and

based

slight

from



from the royalties, which is used for roads and other

K-2063 August 30, 1951

Canada. 10 miles east of Vermilion, Alberta.

Unplowed park land in morainic area. Rain.

little export of crude oil and gas so that the industries

must come to it.

soils department. Mitchell and I have dinner in his home and are back to the hotel at 10:30, very tired, wet, and cold.

The grain we saw today looks quite green. Unless the frost holds off for a couple of weeks, it will be badly injured. Near Edmonton, land now sells for about \$100 an acre, which is quite a price for dark Chestnut soil. Edmonton is a boom-town, partly because of natural growth in a flourishing agricultural area, and partly because of the recent oil discoveries and the recent establishment of refineries and industries based on gas and other resources.

Fortunately for the development of the area, oil rights on land patented since 1902 belong to the Province. Alberta is now getting a substantial income from the royalties, which is used for roads and other permanent improvements. The Province also permits little export of crude oil and gas so that the industries must come to it.

soils department. Mitchell and I have dinner in
his home and are back to the hotel at 10:30, very
tired, wet, and cold.

The grain we saw today looks quite green. Unless
the frost holds off for a couple of weeks, it will
be badly injured. Near Edmonton, land now sells for
about \$100 an acre, which is quite a price for dark
chestnut soil. Edmonton is a boom-town, partly
because of natural growth in a flourishing agricultural
area, and partly because of the recent oil discoveries
and the recent establishment of refineries and industries
based on gas and other resources.

Fortunately for the development of the area, oil
rights on land patented since 1902 belong to the
Province. Alberta is now getting a substantial income
from the royalties, which is used for roads and other
permanent improvements. The Province also permits
little export of crude oil and gas so that the industries
must come to it.

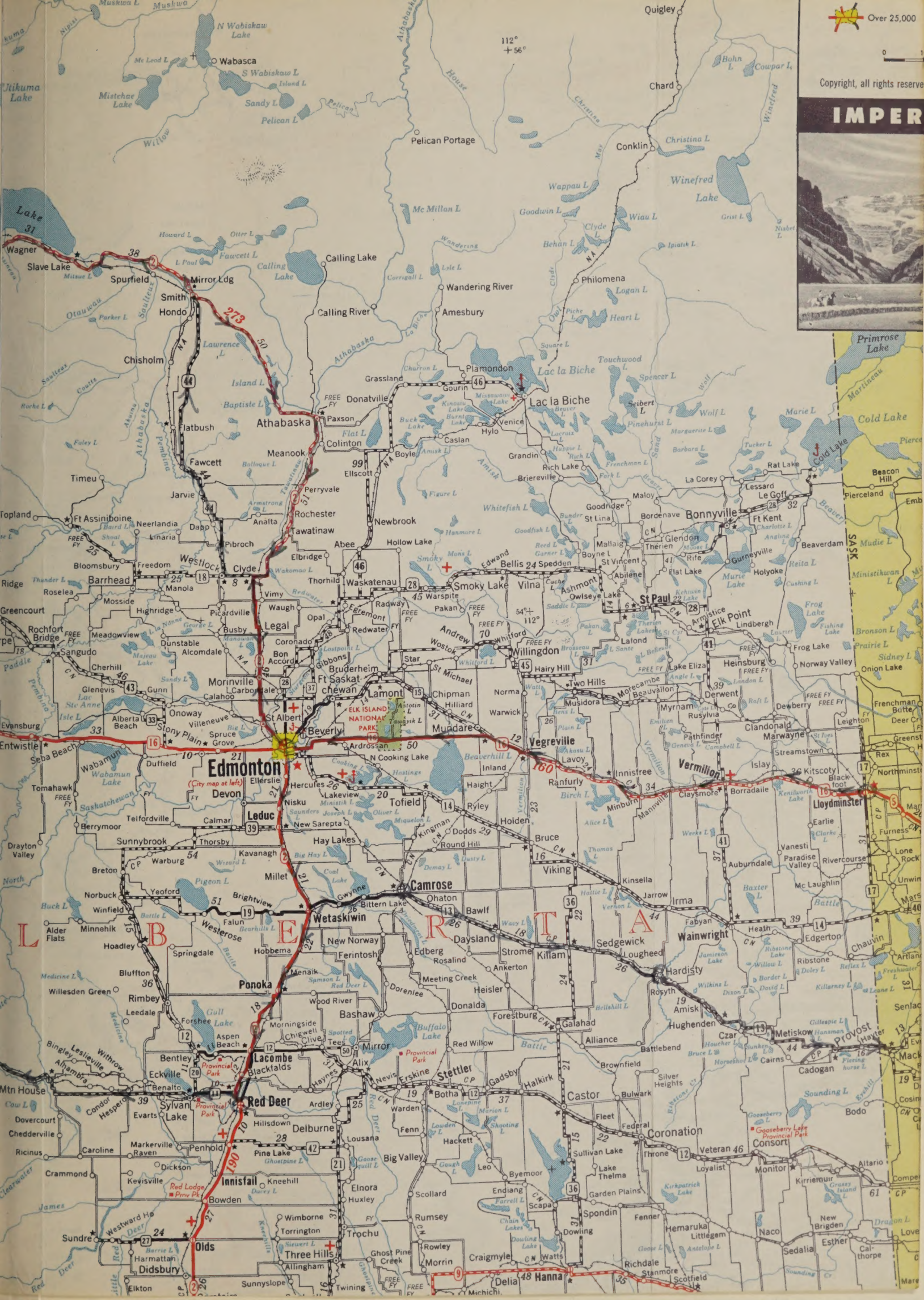
August 31

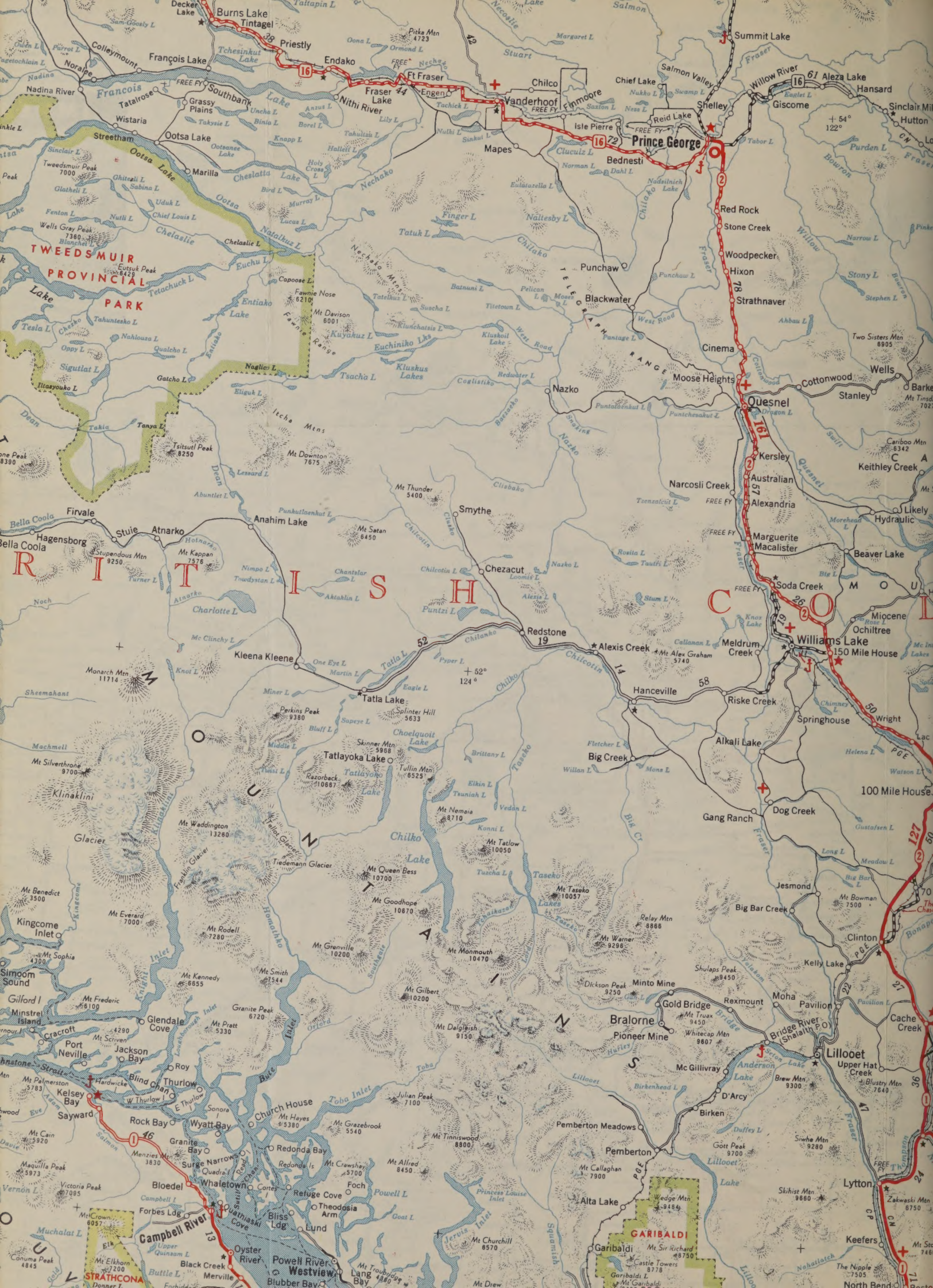
We leave Edmonton for the Peace River country, about 8:30 on a cool misty morning. We travel on Chernozem soils for some distance. About ten miles north of Edmonton, a little south of Morinville, I look at the soil in an undulating lake plain. It is very muddy in the low places. I look at the soil first, where it is a bit poorly drained perhaps.

- | | |
|------------------------|---|
| A ₁ 0 - 14" | Black mixed fine and medium granular clay loam to clay. |
| B 14 - 32" | Very dark gray (3/0) mixed medium granular and fine subangular blocky clay; friable. |
| C _{gca} 32" / | Olive gray clay mottled with light gray. A few yards away the soil is better drained. |

The higher soil on low mounds (Malmo ?) is a bit browner in the B:

- | | |
|--------------------------|--|
| A ₁ 0 - 16" | Very dark grayish-brown to black finely granular clay loam. |
| B 16 - 32" | Very dark grayish-brown (2.5Y 3/2) clay with weak medium prismatic structure that falls to angular fine blocky when dry. |
| C _{ca} 32 - 36" | Brownish lacustrine clay mixed with unconforming sandy loam. |





The solonetzic associate is prominent in the low places. In this and in the other parts of the association, except for the low ridges, there seems to be some gley. Bowser says that most of the soil outside of the Gray Wooded region has some Solonetz influence and that normal Chernozem and Brown soils are not prominent in Alberta.

East of Westlock we drive into a very bad place where the road is under construction with no traffic direction; cars and trucks get all tangled up going both ways and we have a long wait. If the road were the least bit muddier we shouldn't make it.

About twenty miles south of Smith we pass an undulating sandy area with Podzol soil. It has a prominent light gray A_2 about five to six inches thick with a weak yellowish-brown B over yellowish loamy sand mottled with gray.

The rain continues and the roads are bad. It is so cold that if it clears, frost is inevitable.

I look at a disturbed Gray Wooded soil on undulating till a few miles south of Smith.

A ₁		Very thin.
A ₂	0 - 7"	Brown to dark brown (10YR 4/3) platy very fine sandy loam.
B ₁	7 - 10"	Pale brown (10YR 6/3) sandy clay loam with poor to moderate medium blocky.
B ₂	10 - 22"	Dark grayish-brown (2.5Y 4/2) clay with strong medium angular blocky.
	(?)	
B ₃	22 - 30"	Dark gray to dark grayish-brown clay somewhat like the above but a trifle heavier.
C _{ca}	30 - 40"	Brownish calcareous mixed clay and sand in streaks, mottled with clay.

We have a late lunch at Smith and drive on west in the rain. I look hastily at a Gray Wooded soil from a very heavy lacustrine clay near Kinuso.

A ₀	4 - 0"	Brown organic matter.
A ₁	0 - 1"	Dark brownish-gray humus rich clay loam.
A ₂	1 - 5"	Light gray clay mottled with brownish-gray; weakly platy.
B ₂	5" - 10"	Dark gray (no brown) very heavy clay with moderate medium angular blocky. Plastic and very sticky when wet.



K-2064 August 31, 1951

Canada. A few miles west of Smith, Alberta. Virgin forest; mostly aspen and white spruce. Here aspen (white) seems to be climax. Rain.



K-2065 August 31, 1951

Canada. West of Smith, Alberta. Mitchell, Newton, and Bowser.

Here along the south shore of Lesser Slave Lake most of the land is in forest with spruce in the low places and white poplar and white spruce on the upland. These are the tallest and nicest poplars I have ever seen. This mixture probably represents the real climax forest.

About three miles east of High Prairie we come out on a large, nearly level alluvial plain with just a bit less than normal drainage, about class 3, moderately well drained.

I look at this soil, called High Prairie.

- | | |
|---|---|
| A ₁ or p 0 - 4 $\frac{1}{2}$ " | Very dark grayish-brown to very dark brown (10YR 2.5/2) very fine sandy loam to coarse silt loam; moderate fine granular; many small roots. |
| B 4 $\frac{1}{2}$ - 9" | Dark yellowish-brown (10YR 4/4) coarse silt loam. Very weak coarse to medium blocky that is very easily friable to soft fine granular. |
| C _{1g} - G $\frac{1}{9}$ - 28" | Gray to grayish-brown, mottled with brown, coarse silt loam. Some lamination with bands of dark brown organic-rich soil. |

1/ Gley is partly fossil.



K-2066 August 31, 1951
 Canada. 3 miles east of High Prairie, Alberta.
 Harvest just started on High Prairie soil.



K-2067 August 31, 1951
 Canada. Near High Prairie, Alberta. Newton, Mitchell,
 Bowser.

C_g ^{1/}

Strikingly and finely mottled dark gray, reddish-brown, and light gray; laminated; vesicular; easily friable.

The soil material is said to be largely of Tertiary origin. Unfortunately, there is not much of this soil. It is certainly a nice one. Cleared land here sells for about \$40 per acre. Interestingly enough, the grain here is riper than it is near Edmonton. Perhaps the season has not been quite so wet. The shorter growing season is fully compensated for by the longer summer days.

We arrive in High Prairie at 6:30 and meet Mr. W. Odynsky, of the Alberta Research Council in charge of the survey of the Peace River country, and Mr. Andrew Wynnyk, his very quiet assistant.

This small trading town (where "culture meets agriculture" according to the sign post) has very muddy streets and looks like any other frontier trading place. It reminds me a great deal of Alaska. I am early to bed with a very sore back from the rough roads.

^{1/} See footnote 1 on page 40.

September 1

We leave for the field at 8:30 and stop near Triangle on a low plain of lacustrine clay. Originally the soil had a fairly heavy stand of forest, mostly poplar and white spruce. Now the soil is used for alfalfa seed, oats, barley, and the like. I look at the Nampa soil in a slightly disturbed roadside cut.

- | | | |
|----------------|----------|---|
| A ₀ | 2 - 0" | Dark brown peaty root mat. |
| A ₁ | 0 - 1" | Dark grayish-brown humus-rich clay loam; pH 5.9. |
| A ₂ | 1 - 5" | White (5Y 8/2) heavy silt loam to heavy clay loam mottled faintly with pale yellow. Moderate coarse platy structure; easily friable to powder when dry; rich in silt; pH 4.8. |
| A ₃ | 5 - 10" | Light gray (5Y 7/2) mottled with pale yellow (5Y 7/3) heavy silt loam to silty clay loam. Moderate coarse to medium blocky; vesicular. |
| B ₁ | 10 - 11" | Transitional. |
| B ₂ | 11 - 15" | Very dark gray (5Y 3/1) clay mottled and streaked with brown; very light gray when fairly dry. Moderate to strong coarse blocky with weak prismatic; pH 5.1. |



K-2068 September 1, 1951
Canada. Near Triangle, Alberta. Profile of Nampa soil.



K-2069 September 1, 1951
Canada. Near Triangle, Alberta. Landscape of Nampa soil.

- B₃ 15 - 30" Very dark grayish-brown (9.5Y 3/2) clay with moderate to weak coarse blocky. Hard when dry and plastic when wet. Somewhat darker in the lower part.
- C 30 - 36" / Mottled and layered very dark gray and very dark grayish-brown calcareous clay. Layering inherited from the parent material. 1/

Today we have clear weather for the first time in several days. Apparently it hasn't rained nearly so much here as in Edmonton and Saskatoon.

I look hastily at Kenzie Peat -- a moss peat over a very well developed dark gray clay (gley).

- A₁ Very thin.
- A₂ 0 - 5" White (5Y 8/2), faintly and finely mottled with pale yellow, heavy silt loam; moderate medium platy.
- A₃ 5 - 30" Light gray (5Y 7/2), mottled with pale yellow, heavy silt loam; moderate medium subangular blocky.
- B₁ 30 - 36" Transitional.
- B₂ 36 - 112" Very dark brown (10YR 2/2) clay

1/ Added later: This profile with minor variations was seen many times later in the Gray Wooded part of the Peace River country.

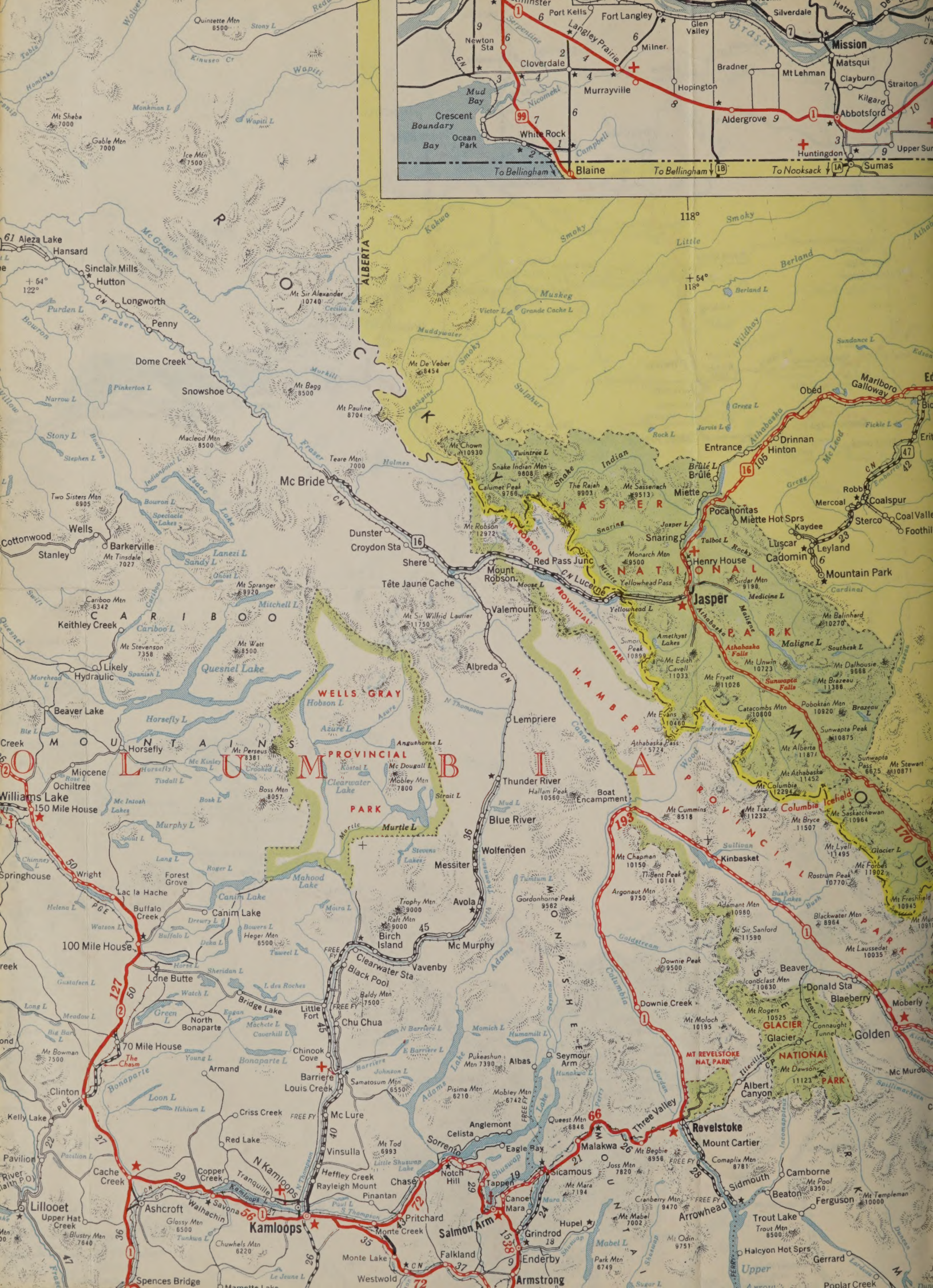
- B₃ 112 - 125" Very dark grayish-brown (2.5Y 3/2) clay with weak coarse blocky structure; poorly reactive; friable only with difficulty; plastic and sticky when wet.

As we drive north it is explained to me that it is difficult to obtain wells in much of this Peace River country and that farmers build dugouts to catch local rain for a water supply. If built according to approved specifications, the Provincial government gives the farmer a \$100 subsidy for a dugout. While taking a picture of one of these dugouts a new settler stopped to talk. He was from Quebec. He talked a bit about grain and legume seeds. When asked about cows, he says, "What the hell do you think I left Quebec for?"

At the McLennan Illustration Station I look at another example of the Nampa soil. This has been disturbed a bit and the A_0 is gone.

A_1	Very thin.
A_2 0 - 5"	White (5Y 8/2), faintly and finely mottled with pale yellow, heavy silt loam; moderate medium platy.
A_3 5 - 8"	Light gray (5Y 7/2), mottled with pale yellow, heavy silt loam; moderate medium subangular blocky.
B_1 8 - 8 $\frac{1}{2}$ "	Transitional.
B_2 8 $\frac{1}{2}$ - 14 $\frac{1}{2}$ "	Very dark brown (10YR 2/2) clay; strong medium angular blocky. Hard when dry, plastic and sticky when wet. Somewhat darker and more brown than the lower part.
B_3 14 $\frac{1}{2}$ - 25"	Very dark grayish-brown (2.5Y 3/2) clay with weak coarse blocky structure; nearly massive; friable only with difficulty; plastic and sticky when wet.







K-2070 September 1, 1951
 Canada. South of McLennan, Alberta. A "dugout" for
 water supply in heavy soils where wells are not possible.

C 25 - 30" / Very dark gray to black (with brownish cast, about 2.5/1) heavy plastic clay. Fairly easily friable when moist; weak fine blocky with some natural granulation; calcareous.

The soil here is nearly level. In all of the soils, and perhaps especially in the Gray Wooded kinds, there are few clear distinctions between the C and C_{ca}.

North of Falher, about one mile, I look hastily at Degraded Chernozem (locally called a degraded "Black," tending toward Rycroft, a "Black"). The soil has been slightly disturbed. The surface is very gently undulating. The grayer, more podzolized soils are in the lower places as compared to the slight swells.

A₁ 0 - 5" Black silty clay loam with strong medium to fine granular structure.

A₂ 5 - 8" Grayish-brown (10YR 5/2) to light grayish brown (10YR 6/2) silty clay loam; mixed moderate medium subangular blocky and platy.

B₁ 8 - 10" Transitional in color; strong medium angular blocky.

B₂ 10 - 23" Very dark grayish-brown (10YR 2/2) heavy clay; strong medium angular blocky and weak prismatic.

C_{ca} and C Very dark brown to black clay streaked with olive brown and finely mottled with light gray; weak medium blocky to massive; plastic and sticky when wet.

We drive north and east about ten miles north of Donnelly. I look at the Braeburn soil from undulating

lacustro-till. This soil is somewhat like the Nampa but has more relief and more grit and stones in the lower solum.

A₀ Very thin dark brown root mat.

A₁ Very thin dark grayish-brown silt loam.

A₂ 0 - 6" White (10YR 8/2), mottled with very pale brown, heavy silt loam; mixed weak subangular blocky and moderate medium platy.

A - B 6 - 8" Transitional.

A₂ 8 - 14" Grayish-brown (10YR 5/2) clay with strong medium angular blocky and weak prismatic; roots are flattened.

B₃ 14 - 24" Grayish-brown (10YR 5/2), mottled with brown (10YR 4/3), clay. Weak to moderate medium blocky; hard when dry, and plastic when wet.

C 24 - 30" / Very dark gray heavy clay (till) faintly mottled with brown; moderate fine angular blocky.

My companions tell me that the soil is a bit too rich in clay in the B to be a good representative of the series.

We go on north and east towards Peace River. Just south of Nampa we pass over the Falher (Degraded Chernozem) and Nampa (Gray Wooded) association. They are used mainly for wheat and alfalfa seed. As we approach Peace River there is more relief. The soils are better drained and the surface soils are browner.

We stop on the edge of the plain overlooking the town of Peace River and I take pictures. It is a beautiful view. We drive down into the town. I do a bit more useless shopping for field boots. This town also has muddy streets and the characteristic frontier aspect. We drive for a distance north and then turn back about 5 o'clock and return to Falher for the night.

The Peace River is deeply trenched into the general plain. The immediate flood plain is narrow. On either side are long slump slopes, a mile or so wide, and I estimate around five or six hundred feet high, between the river and the plain.

On three or four occasions today we saw low mounds that seem to me to represent the action of frost during a previous period. We are supposed to see better examples tomorrow.

All, or nearly all, of the hotels in this area have beer parlors that remain open until 10:00 P. M. This one is no exception. According to the law one must be seated at the table and then can order beer, tomato juice, or ginger ale, but nothing else. Apparently some of the boys come in early Saturday afternoon and spend the rest of the day. At least quite a few are drunk. Thank goodness they have to close at 10 o'clock.

We stop on the edge of the plain overlooking the town of Peace River and I take pictures. It is a beautiful view. We drive down into the town. I do a bit more useless shopping for field boots. This town also has muddy streets and the characteristic frontier aspect. We drive for a distance north and then turn back about 5 o'clock and return to Fairbairn for the night.

The Peace River is deeply trenched into the general plain. The immediate flood plain is narrow. On either side are long steep slopes, a mile or so wide, and I estimate around five or six hundred feet high, between the river and the plain.

On three or four occasions today we saw low mounds that seem to me to represent the action of frost during a previous period. We are supposed to see better examples tomorrow.

All, or nearly all, of the hotels in this area have beer parlors that remain open until 10:00 P. M. This one is no exception. According to the law one must be seated at the table and then can order beer, tomato juice, or ginger ale, but nothing else. Apparently some of the boys come in early Saturday afternoon and spend the rest of the day. At least quite a few are drunk. Thank goodness they have to close at 10 o'clock.



K-2071 September 1, 1951
 Canada. Near Peace River, Alberta. Looking north, over
 the city, to the junction of the Smoky and Peace rivers.



K-2072 September 1, 1951
 Canada. Near Peace river, Alberta, looking north over
 the city and the river to the plateau beyond.

September 2

We leave about 8:50 on a bright sunny morning and drive west. We stop a little way from the hotel to look at the Falher soil -- a Degraded Chernozem.

- | | | |
|----------------|--------------|--|
| A ₁ | 0 - 5" | Nearly black silt loam. |
| A ₂ | 5 - 10" | Light gray to pale brown. Soil is vesicular and ashy and has a moderate platy structure. This suggests the A ₂ of solodized-Solonetz. |
| B | 10 - 25" (?) | Very dark brown heavy clay with strong subangular blocky structure and weak prismatic. |
| C | 25" / (?) | Very dark gray, almost black, heavy lacustrine clay, probably from dark-colored shales. |

This parent material clay contains about 2% organic matter which probably accounts for the moderate fine blocky structure. One would expect it to be massive, but the material granulates readily upon exposure. The roots penetrate well through the B₂.

Road cuts show a very wavy boundary between the upper horizons, suggesting the influence of the low microrelief of the Tundra. Then too, one can see irregularities in clay layers that appear to be due to frost. We go on west a little way and stop at

an association of *Loiseleuria* (*Loiseleuria*), *Chamaenerion*, and *Veronica* (*Veronica*). The soil is *Loiseleuria* and has low *Loiseleuria*. The soil may be inherited from a Tundra period but is *Loiseleuria*.



K-2073 September 2, 1951
Canada. West of Falher, Alberta. A view of recently
plowed field showing mounds that are probably old Tundra
blisters.

an association of Davies (Gray Wooded), Juda (Degraded Chernozem), and Wanham (depression Podzol). The soil is undulating and has low microrelief. Part of this may be inherited from a Tundra period but at least part of it is caused by ordinary tree fall that gives rise to cradle knolls.

We look at the soil called Juda where it is partially clear but not plowed. There must be some confusion. Certainly this is not a Degraded Chernozem. In this landscape tiny differences in relief result in a big change in the A_2 because of the differences in the intensity of leaching and of gleying.

- | | | |
|-------|------------------------|---|
| A_1 | 0 - 3" | Very dark grayish-brown silt loam (10YR 3/2) faintly mottled with near hues. |
| A_2 | 3 - 8" | Brown (about 10YR 5/3) heavy silt loam; mixed medium subangular blocky, granular, and platy. In the road cut nearby, the A_2 is pale brown and has a strong fine platy structure. |
| B_1 | 8 - 10" | Transitional. |
| B_2 | 10 - 22" $\frac{f}{-}$ | Brown (10YR 4.5/3) clay with moderate medium to fine blocky structure. |
| C | 22 - 36" $\frac{f}{-}$ | Laminated dark brown to gray silty clay loam. Fairly firm in place but digs out in easily friable angular fragments. |

The upper A_2 has a pH of 5.0. It seems to me that this soil is moving toward a Podzol. About six or seven miles west of Falher we look at the Davies soil in a road cut through a small knoll some two or three hundred feet in diameter. The soil is Gray Wooded with a brown B horizon underlain by somewhat salty calcareous silty very fine sand, which is over heavy clay in depth. I believe the low places here have ordinary Tundra ponds and that these knolls have been thrust up by frost action during the Tundra period. The surface now has many cradle knolls.

About ten miles out we look at a weakly podzolized soil on calcareous sand. This is obviously an old dune. The source of the sand is not known.

We go on west by ferry over the Smoky River. This is a deeply trenched branch of the Peace River. Like the Peace, it has a narrow bottom and wide slump slopes to the plain above. Then we come up on the plain just west of the crossing. We are certainly in an old bumpy Tundra plain. The glacial lake, wind, stream action, and frost have combined to form a very bumpy mezzo-relief

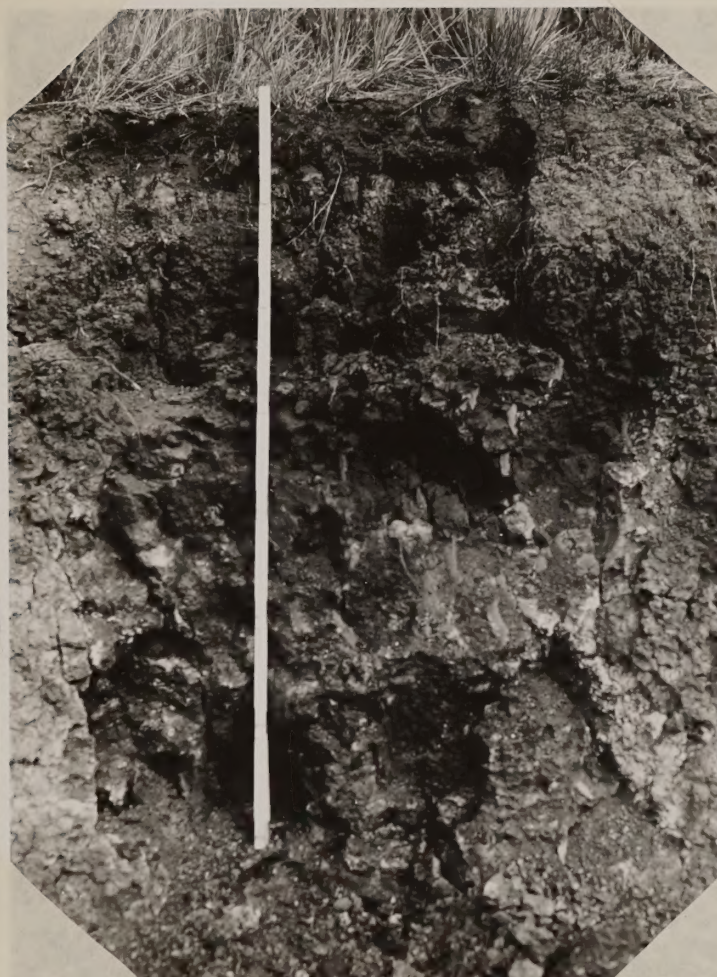
with cradle knolls on the uplands and wet spots in the lowlands. I suspect that shortly after the lacustrine period when the streams first started to flow north into the McKenzie, that this plain had permafrost. Perhaps the streams developed low natural levies of brownish alluvium along the banks. Likely this alluvial cover thinned out over a distance of several hundred yards, or perhaps a few miles from the stream. Thus during freezing at the surface the hydrostatic pressure of the water in the river would be added to the pressure caused by the freezing surface, and thus thrust up irregular mounds. In some cuts the mound is made up largely of brownish material, while in many great gobs of the clay were also thrust up near the margins, rarely in the very center. This would happen if the permafrost table were below the contact of the lacustrine clay and the alluvium. Although these mounds are small and sharp, many of them have little depressions right in the middle. They resemble huge doughnuts.

with cradle knolls on the uplands and wet spots in the lowlands. I suspect that shortly after the lacustrine period when the streams first started to flow north into the Mackenzie, that this plain had permafrost. Perhaps the streams developed low natural levees of brownish alluvium along the banks. Likely this alluvial cover thinned out over a distance of several hundred yards, or perhaps a few miles from the stream. Thus during freezing at the surface the hydrostatic pressure of the water in the river would be added to the pressure caused by the freezing surface, and thus thrust up irregular mounds. In some cases the mound is made up largely of brownish material, while in many great gaps of the clay were also thrust up near the margins, rarely in the very center. This would happen if the permafrost table were below the contact of the lacustrine clay and the alluvium. Although these mounds are small and sharp, many of them have little depressions right in the middle. They resemble huge doughnuts.

We have some confusion here. Mr. Odynsky is driving the lead car and we lose sight of him. We drive very rapidly but fail to overtake him. We continue on west over large areas of the Donnelly soil -- a Gray Wooded soil in gley transition with a very heavy dark grayish-brown B₂. The A₁ is two to five inches thick but deep broad tongues go down as much as 24 inches. The A₂ is two to five inches thick and the B₂ has moderate medium angular blocky structure. This irregularity of the surface horizons, especially of the A₁, suggests an original microrelief characteristic of imperfectly drained Tundra.

We drive on to Rycroft for lunch and still fail to find our companions. Near the village we look at the Rycroft soil -- a "Black" or Chernozem from heavy clay. The surface is level to very gently undulating. The soil is moderately to imperfectly drained.

A ₁ 0 - 9½"	Black (2/0) clay with strong fine granular structure.
B ₂ 9½ - 19"	Very dark grayish-brown, with olive tinge (2.5Y 2/2), clay. Weak angular blocky; hard when dry; plastic and sticky when wet. Exposed soil granulates with wetting and drying.



K-2075 September 2, 1951
Canada. Near Rycroft, Alberta. Profile of
Rycroft -- a Chernozem from heavy clay.

B₃ 19 - 24" Dark olive gray clay (5Y 3/2).
Massive to very weak medium blocky;
hard when dry, plastic and sticky
when wet.

C_{ca} and C 24 - 36" / Very dark gray (2.5Y 3/2) plastic
sticky clay, mottled with light
grayish-brown and olive brown.
Calcareous and likely has some gypsum.

When dry, the soil shows moderate coarse prismatic
structure below the A₁. (See photograph)

Mr. Bowser was quite concerned about our companions
who drove away so rapidly from the ferrier. We don't
find them in the hotel nor any message. We leave a
message at both the hotel and the filling station
and go on south toward Grande Prairie. About twelve
miles south of Rycroft I look at an imperfectly drained
soil now called Valleyview. It is a strongly solodized
chernozemic Solonetz.

A₁ 0 - 5½" Black clay loam or clay with
strong fine granular structure.
Soil is held firmly by grass roots.

A₂ 5½ - 9" Light brownish-gray (2.5Y 5/2) to
olive gray (5Y 5/2) silty clay
loam; weak platy on weak medium
blocky.

B₂ 9 - 19" Black (5Y 2/2) heavy clay with
strong coarse columnar structure
when fairly dry. The soil breaks
into hard angular blocky; friable
only with great difficulty. The
upper ½" of the column is gray. The
caps are well formed. The soil is
very hard when dry.



K-2076 September 2, 1951
Canada. 6 miles south of Rycroft, Alberta. Typical
small farm on Chernozem.

- B₃ 19 - 25" Dark olive gray clay (5Y 3/2).
Very weak coarse prismatic;
hard when dry.
- C_{ca} 25 - 32" Nearly massive olive gray clay, mottled
with light olive gray and light gray;
plastic and sticky.
- C- 32 - 36" / Light olive gray clay mottled with near
hues; sticky and plastic; many crystals
of gypsum.

About half way between Rycroft and Sexsmith on
Saddle Hills we look at a moderate sloping Gray Wooded
soil from till at about 3,000 feet elevation.

- A₀ 3 - 0" Brown peaty partly decomposed litter.
- A₁ 0 - 1/2" Dark grayish-brown silt loam.
- A₂ 1 1/2 - 4 1/2" Light grayish-brown (10YR 6/2) silt
loam with weak platy over weak blocky
structure; pH 5.2.
- B₁ 4 1/2 - 6" Transitional.
- B₂ 6 - 19" Pale brown (10YR 6/3) sandy clay
loam with strong medium subangular
blocky; pH 5.2.
- B₃ 19 - 25" Mottled grayish-brown and light
olive brown silt loam (2.5Y 5/2 to 5/4).
- C 25" / Similar to B₃ but with little mottling.

A₁ 0 - 7" Nearly black fine sandy loam with
fine soft granular structure.

A₂ 7 - 9" Light grayish-brown fine sandy loam
with weak blocky structure.

Our companions join us and we drive on south.

I stop for a moment to see a Degraded Chernozem with a deep A_1 that has four to five inches of well-developed ashy platy A_2 over the dark gray B_2 , characteristic of the Gray Wooded soils. This soil could have had two cycles of vegetation.

I get a beautiful view of Sexsmith, a village with seven very large grain elevators. The village calls itself "The Wheat Capital of the British Empire."

Although it is late in the afternoon we drive on south and west through Grande Prairie and then west a few miles where we can see the mountains to the west and southwest. Here the macrorelief is in long easy ridges, inherited from the hard rock beneath but covered with heavy till. The easiest slopes have soils transitional between Humic-Gley and Gray Wooded with some Solonetz influence. The Grande Prairie soils are gently undulating, "Black" or Chernozem, from heavy clays. I stop to look at one of these hurriedly a mile or so west of Grande Prairie.

A_1 0 - 7"	Nearly black fine sandy loam with fine soft granular structure.
A_2 7 - 9"	Light grayish-brown fine sandy loam with weak blocky structure.



K-2077 September 2, 1951
Canada. Sexsmith, Alberta. Note 7 grain elevators.
Wheat on Chernozem in foreground.

B₂ 9 - 18" Very dark brown to very dark olive gray heavy clay. Strong coarse prismatic structure tending toward columnar; definite suggestion of Solonetz.

C_{ca} and C 18 - 30" / Very dark olive gray clay with some light gray mottling.

Probably most of the soils in this plain are slightly degraded solonetzic Chernozem. The C_{ca} horizons are not well-expressed.

We go back to Sexsmith for the night at 7:00 P. M. We have a discussion about the importance of frost action to account for some of the soil features that we have seen today. I was particularly impressed today with the complicated patterns of mounds and swales on the plateaux lying just above the slump-marred slopes on either side of the Smoky River. Of course besides the frost there has been some blowing, yet there are only a few dunes. Earlier explanations given my companions are that these knolls are kames were certainly in error.

Very tired to bed.

September 3

We leave Sexsmith about 11:30 on a road well worth
 driving and drive south and then east, north of Grande
 Prairie.



K-2078 September 3, 1951

Canada. Entrance to Sexsmith -- "the wheat capital of
 the British Empire."

September 3

We leave Sexsmith about 8:45 on a cool and sunny morning and drive south and then east, north of Grande Prairie.

We look at some cuts in this black soil and it seems to be a solonetzic and gleyic Chernozem. I try to get some photographs to show the very wavy lower boundary of the A_1 . I am convinced this is a relict from the characteristic Tundra mounds that form on imperfectly drained soils. The soil I photograph is called Landry. There is a faint A_2 and a strong blocky B developed from heavy lacustro-till.

We drive on east toward the crossing of the Smoky. I see some more of these little hillocks with depressions in the center. The till is irregular and is covered irregularly in places with brownish material. On these are Gray Wooded soils with prominent B horizons that are brown in color. In these the C_{ca} is strongly calcareous and light grayish-brown mottled with very light gray and yellowish-brown. The upper part of the C suggests the gammate structure recognized so widely in New Zealand. This upper browner material over the heavy salty till is like the old alluvium that has been moved through frost action.



K-2079 September 3, 1951
Canada. 4 miles north and 2 miles east of Grande
Prairie, Alberta. Upper part of solonetzic, gleyic
Chernozem. Wavy A₁ likely due to frost.



K-2080 September 3, 1951
Canada. 4 miles north and 2 miles east of
Grande Prairie, Alberta. Upper part of solonetzic,
gleyic Chernozem. Wavy A₁ likely due to frost.
Another view.



K-2081 September 3, 1951
 Canada. 4 miles north and 2 miles east of
 Grande Prairie, Alberta. Upper part of solonetzic,
 gleyic Chernozem. Wavy A₁ likely due to frost.
 Another view.

We cross the river and again come into a plateau having these knolls or hillocks of brown silty and fine sandy material over the heavy calcareous clay, but the contact is irregular. Great masses of the clay have been squeezed up into the hillocks especially near their margins but much less frequently in their very centers.

Ten miles west of Clarkson Valley I look at a solonetzic Gray Wooded soil on very gently undulating lacustro-till associated with Bog soils in the low places. Here the A_2 is prominent and there is a fairly well developed columnar B_2 . The temperature at 18" under a cover of second growth aspen is 45° F.

A_0	2 - 0"	Brown peaty mat.
A_1		Very thin; temperature 45° F.
A_{21}	0 - $4\frac{1}{2}$ "	Pale brown (10YR 6.5/3) fine sandy loam; moderate medium platy; friable.
A_{22}	$4\frac{1}{2}$ - 8"	Light gray (10YR 7/2) light fine sandy loam; loose and very friable; weakly platy.
B_1	8 - $8\frac{1}{2}$ "	Light gray vesicular caps of columns.
B_2	$8\frac{1}{2}$ - 16"	Dark grayish-brown (2.5Y 4/2) tending toward dark olive, heavy clay; moderate medium columnar that breaks into strong medium angular blocky.



K-2082 September 3, 1951
Canada. Near crossing of Smoky River east of Bezyanson,
Alberta. Characteristic mounds, likely due to frost in
earlier Tundra period. Like many, this one has a central
depression.



K-2083 September 3, 1951
 Canada. West of Goodwin, Alberta. Smoky River
 showing characteristic slump slopes from the nearly
 level plain above.

- B₃ 16 - 27" Very dark gray to black (5Y 2.5/1) heavy clay; strong medium to coarse angular blocky; hard when dry; plastic when wet.
- C_{ca} 27 - 32" Dark olive gray heavy clay finely mottled with very light gray; massive with suggestion of fine blocky; very easily friable.
- C 32 - 36" / Dark olive gray clayey till mottled with grayish and reddish-brown. The material digs out in clods that fall into rather easily friable fragments; material is somewhat darker in depth.

Roots penetrate into the B₃. Under the second growth aspen is a ground cover of cranberries and the like.

Drainage is about class 3, moderately well drained.

This looks to me like a Gray Wooded soil developed over a solodized-Solonetz.

We stop for lunch at the soil survey camp near Sturgeon Heights.

To the east we stop and look hastily at a Gray Wooded soil from very heavy lacustro-till. Here the light grayish-brown A₂ is four or five inches thick over very heavy dark grayish-brown clay with laminated very dark gray C beneath.

Near Valleyview I look hastily at a solonetzic soil from very heavy clay over salt-rich clayey sandstone.



K-2084 September 3, 1951
Canada. 20 miles west of High Prairie, Alberta.
Virgin poplar and white spruce on Nampa soil.



K-2085 September 3, 1951
Canada. 18 miles west of High Prairie, Alberta.
Pioneer home on Nampa-Falher soil association.

We then drive east through a large uncleared area of undulating soil which is imperfectly drained to well-drained with some well-drained low knolls and some shallow swamps.

About 15 miles west of High Prairie I look again at the Nampa soil in the Nampa-Falher association. The Nampa soil is developed from very gently undulating lacustro-till under a good stand of poplar and spruce. Where I examine the soil it is moderately well drained.

- | | | |
|-----------------------|------------|--|
| A ₀ | 2 - 0" | Brown peaty turf. |
| A ₁ | 0 - 1" | Brown granular silty clay loam. |
| A ₂ | 1 - 6" | Granular silty clay loam; mixed pale brown (10YR 6/3) and brown (10YR 5/3). |
| B ₂ | 6½ - 17" | Very dark gray to very dark grayish-brown (2.5YR 3/1) clay. Moderate to strong medium angular blocky and moderate prismatic; hard when dry and very plastic and sticky when wet. |
| B ₃ | 17 - 21" | Like B ₂ but light brown and coarser in structure. |
| C _{ca} and C | 21 - 36" / | Very dark gray to black clay, mottled with light gray; massive to weak blocky. |

Roots penetrate the entire solum. There are some stones in the solum and in the surface. Only about 50 feet away the A₂ is eight inches deep and very light gray to pale brown while the upper B is very dark grayish-brown.

I get the impression that the men here are inclined to split the soil series a bit too much on the supposed genesis of the parent material, whether till, lacustrine, or lacustro-till. After all, the clay in these materials apparently comes from the same source -- a dark heavy shale. Since the B horizons are so heavy, small differences in the C are not very significant. I should pay relatively more attention to soil slope and the evidences of drainage in the profile and relatively less to the supposed agent of deposition of the parent material.

We drive on through High Prairie to Faust.

I am early to bed with a very sore back.

Degraded Chernozems on softly and gently rolling landscape where the farms are nice.

After lunch in Athabasca we drive on south through lowlands that must have been an outlet for water from the Peace River country during the time the Boreal Sea had been blocked off by ice. Along the way I saw quite a bit of stony glacial material. Near the southern end of this valley, too large for the present drainage, we pass a large sandy area with dune-like surface. This sand was probably dropped in an old delta as the water coming from the Peace River country came into the old lake basin around Edmonton.

September 4

We leave at 8:45 on a bright sunny morning for Edmonton.

East of Canyon Creek I see a well-developed Podzol on sand near the shore of Lesser Slave Lake. The soil resembles the sandy Podzols I have seen along the lake between Port Huron and Detroit, Michigan. Here there is a good ashy gray A_2 , some four to six inches thick with deeper tongues, but only slight cementation in the B_2 .

We pass Smith and take the road to Athabasca (equals sparkling water) near Baptiste Lake. We pass some nice Degraded Chernozem on softly and gently rolling landscape where the farms are nice.

After lunch in Athabasca we drive on south through lowlands that must have been an outlet for water from the Peace River country during the time the McKenzie had been blocked with ice. Along the way I see quite a bit of stony Solonetz. Near the southern end of this valley, too large for the present drainage, we pass a large sandy area with dune-like surface. This sand was probably dropped in an old delta as the water coming from the Peace River country came into the old laking basin around Edmonton.

A few miles north of Edmonton we look very hurriedly at a typical Chernozem from lacustrine clay. This stop is a bit north of the one we made leaving Edmonton on August 31.

- A₁ 0 - 10" Very dark gray clay loam with moderate fine granular structure becoming weakly prismatic in the lower part.
- A₂ 10 - 12" Pale brown weakly platy clay loam.
- B₁ 12 - 15" Brown, mixed weak prismatic and moderate medium blocky, clay loam.
- B₂ 15 - 20" / Dark grayish-brown clay with moderate to strong angular blocky.

Time is short and we don't excavate deeply. Bowser says that most of the black soils have this sort of solum although many are without the pale brown A₂ and degraded B₁ just above the B₂. Here the land is gently undulating and well-drained.

We arrive at our hotel in Edmonton a little after 6:00 P. M. My back is really roaring tonight after all these rough roads.

- A₁ 0 - 1 1/2" Dark brown light silt loam; friable to fine granular.
- A₂ 1 1/2 - 6" Brown to dark brown (10YR 4/3) heavy very fine sandy loam that grades to (10YR 5/3); weak medium platy; friable; slightly grayer in the lower part.

September 5

We leave Edmonton on a bright sunny morning to drive south. Besides Dr. Mitchell and myself we have Mr. W. E. Bowser and Mr. T. W. Peters. For quite a distance we are on Chernozem. Immediately south of Edmonton we pass a large area of Solonetz soil rather shallow over bedrock; then an area of Chernozem from till partly pitted; and later over a fairly large area of dune sand. Some of the till in this region has a thin layer of cover sand. We drive on rapidly to Red Deer and then west.

About 15 miles ~~west~~^{east} of Rocky Mountain House I look at a Gray Wooded soil from till that has been covered with some water-carried material. The surface is undulating. Although the road cut is a bit disturbed, there is clear evidence of Brown Podzolic soil impinged on the Gray Wooded one. The soil is locally called Caroline. Where we look at it there is a cover of aspen. Most of this soil is cleared and used for barley and pasture.

- | | |
|------------------------|--|
| A ₁ 0 - 1½" | Dark brown light silt loam; friable to fine granular. |
| A ₂ 1½ - 6" | Brown to dark brown (10YR 4/3) heavy very fine sandy loam that dries to (10YR 6/3); weak medium platy; friable; slightly grayer in the lower part. |



K-2086 September 5, 1951
Canada. 3 miles east of Rocky Mountain House,
Alberta. Micro-Podzol on Gray Wooded.



K-2087 September 5, 1951
Canada. East of Rocky Mountain House, Alberta.
Stone line -- till beneath, alluvium above.

K-2087 September 5, 1951
Canada, East of Rocky Mountain House, Alberta.
Stone line -- Ell beneath, aluvium above.

- B₁ 6 - 11" Brown (10YR 5/3) fine sandy clay loam; moderate medium blocky.
- B₂ 11 - 21" Dark grayish-brown (10YR 4/2) clay with moderate to strong medium angular blocky and weak prismatic.
- C - D 21 - 30" / Nearly structureless olive brown (2.5Y 4/4) to dark grayish-brown (10YR 4/2) friable sandy loam.

Roots go into the C. This soil is said to be deficient in sulphur for crops.

About three miles east of Rocky Mountain House we look at a micro-Podzol over Gray Wooded soil from till. This till also may have had some cover. The soil is undulating. The cover is white spruce, aspen, balsam of Gilead, lodge-pole pine, etc. The elevation is about 3,150.

- A₁ 0 - $\frac{1}{2}$ " Very dark gray to black humus soil.
- A₂ (Podzol) $\frac{1}{2}$ - $1\frac{1}{2}$ " Pinkish gray (7.5YR 6.5/2) fine sandy loam; moderate medium platy; friable.
- B₂ (Podzol) $1\frac{1}{2}$ - 3" Yellowish-brown (10YR 5/4) heavy fine sandy loam; weak granular to structureless; easily friable.

- A₂ (Gray Wooded) 3 - 6" Yellowish-brown (10YR 5/4)
heavy sandy loam; mixed weak platy
and weak blocky.
- B₁ 6 - 12" Dark grayish-brown to olive gray light
sandy clay loam; weak to moderate
medium blocky.
- B₂ 12 - 18" Dark grayish-brown (10YR 4/2)
sandy clay with moderate to strong
blocky and weak prismatic.
- C 18 - 24" / Olive gray (5Y 5/2) sandy clay
loam mottled with light gray;
slightly compact but digs out
in easily friable fragments.

In places along here the B of the micro-Podzol is a bit more brown. I try for pictures although my companions tell me that better examples are to be seen later. We drive on west several miles. I see a Podzol on dune sand but without ortstein. The soils are predominantly Gray Wooded with micro-Podzols here and there. We don't find a good place for a photograph. The west side of the road is too wet and the east side has been badly ripped to pieces by the road builders. We turn back and stop occasionally but find nothing new, so go on to our hotel at Red Deer about 7:00 P. M.

A little way north we stop near the Lacada Experimental Station to look at a soil called Pando and were recently Belmont. The soil is undulating and seems to be excellent for cereal crops.

September 6

We leave Red Deer about 8:30 and drive north.

A few miles out we stop to look at Penhold -- a deep "Black," or Chernozem, from calcareous silty and fine sandy alluvial-lacustrine material originally from the Rocky Mountain dolomites. The soil is undulating with fairly short slopes. It is used mainly for cereals. Where we look at it there has been some disturbance.

- | | | |
|-----------------|---------------------|--|
| A ₁ | 0 - 10" | Black finely granular fine sandy loam to silt loam. |
| A ₃ | 10 - 17" | Nearly black light sandy clay loam somewhat firm but easily friable. |
| B | 17 - 24" (variable) | Very dark brown light sandy clay loam becoming dark yellowish-brown in depth; weak coarse prismatic structure; easily friable. |
| C _{ca} | 24 - 32" (variable) | Light olive brown fine sandy loam; nearly structureless but digs out in easily friable clods. This merges into: |
| C | 32 - 36" / | Faintly mottled brown and light yellowish-brown silty and fine sandy loam; only slightly firm and easily friable. |

Many krotovinas are throughout the profile.

A little way north we stop near the Lacombe Experimental Station to look at a soil called Ponoka and more recently Belmont. The soil is undulating and seems to be excellent for cereal crops.

- A₁ 0 - 14" Black light silt loam; slightly firm but easily friable to fine granular.
- A₂ Discontinuous.
- My attention is called to this discontinuous slightly gray and slightly platy layer.
- B 14 - 31" Very dark grayish-brown (10YR 3/2 to 2.5Y 3/2) clay loam with moderate medium prismatic structure that falls into friable moderate medium blocky. The soil resembles the B₂ of the Chestnut and likely has some Solonetz influence.
- C_{ca} and C 31" / Firm, nearly structureless olive brown (2.5Y 4/4) sandy clay loam; fairly compact in place but removed clods are easily friable.

We have some discussion here about these slight discontinuous A₂ horizons. I suggest that there is great danger in overemphasizing these slight A_{2s} and the B_{2s} with slight Solonetz influence. Certainly the series should not be separated on this basis unless the features are prominently developed and continuous and at least probably related to management.

Five miles south of Wetaskiwin I look at an excellent example of solodized-Solonetz in a complex with chernozemic Soloth and salinized Chernozem.

- A₁ 0 - 7" Nearly black finely granular dark grayish-brown silt loam held in firm turf by roots.
- A₂ 7 - 8" Light gray silt loam; strong platy.

- B₂ 8 - 15" Nearly black clay with strong medium columnar that breaks into strong angular blocky.
- B₃ 15 - 18" Dark grayish-brown clay; moderate medium angular blocky.
- C_{sa} 18 - 30" / Olive salty sticky plastic massive clay.

We drive to Camrose for lunch after crossing a bumpy morain and then a till plain with many small grassy swamps that suggest old Tundra ponds. The small irregular bumps near the edges of these ponds suggest frost action.

After lunch we drive east toward Hardisty and soon leave the Chernozem to pass over thin Chernozem with much Solonetz and solonized soil. I look at this thin Chernozem which resembles the "thin Black" seen near North Battleford. The B has strong medium prismatic structure that breaks into medium angular blocky.

Near Sedgewick we come into the Chestnut soil zone. Many of the soils are Solonetz. Just before reaching Hardisty I try to take some pictures to illustrate the complex of grass and shrubs on the north-facing slopes. These north-facing slopes have many clumps of shrubs and low trees along the drainways and in the coves, with slips between on the steeper slopes, as compared to the more smooth and open south-facing slopes. We stop in the hotel at Hardisty about 5 o'clock.



K-2088 September 6, 1951
Canada. 5 miles west of Hardisty, Alberta. North
slopes of Chestnut soil from till, looking over small
pond. Note slumps of low trees.



K-2089 September 6, 1951
Canada. 4 miles west of Hardisty, Alberta. North
slopes of Chestnut soil from till. Note clumps of
trees and slips.

September 7

We are up for an early start at 7:30 (8:30 Saskatoon time). We bid goodbye to Bowser and the others from Alberta and go on to Saskatoon with Mr. Clayton. I stop along the way for a few pictures but not much to examine soil profiles. The distance is too great and my back is very sore.

East of Unity in Saskatchewan I see an interesting reconstructed solodized-Solonetz in the Chestnut association from shallow calcareous lacustrine material. The dark brown B₂ horizon is moderately prismatic but not columnar.

We reach Saskatoon in the late afternoon after 3,000 miles by car over some bad roads.

I clean up and repack for a very early start in the morning.



K-2090 September 7, 1951
Canada. Near Unity, Saskatchewan. Good farmstead on
Chestnut soil.

September 8

I am up at 4:30 for the train at 5:30. After dressing I find that the train is $2\frac{1}{2}$ hours late -- probably too late for my connection in Winnipeg.

I am finally on the train at 9:00 A. M., about $3\frac{1}{2}$ hours late, but the conductor feels that the time will be made up. I doubt it. What a tiresome ride with such uncertainty about my time schedule to Washington.

I take this occasion to summarize briefly my outstanding impressions about the soils I have just seen.

1. The clumps of trees in the wet spots and on the north-sloping coves, even in the Chestnut soil region. These certainly are spreading now with less prairie fires.
2. The general influence of sodium salts, even on the soils in the Peace River country.
3. The general abundance of lime in the parent materials.
4. The lack of clear distinction between C_{ca} and the C.
5. The unevenness of the lacustrine deposits. Many of the old lake-basins are gently undulating to almost gently rolling.

In the Peace River country the till, lacustro-till, and varved lacustrine clay are similar in structure, mineralogical composition, and physical characteristics.

6. The Gray Wooded soils have a wide range in pH, say from around 5.0 to 7.0 in the A and 5.0 to nearly 7.0 in the B₁.

7. Generally speaking the B of the Gray Wooded is considerably more gray than the B of the Podzol.

8. Great care is required in interpreting what the Canadians call "thin Black soils." This name includes a lot of quite different soils genetically such as (1) Chernozem-Chestnut transition (2) Chernozem-Gray Wooded transition (3) Rendzina-Chernozem transition and (4) lithosolic Chernozem. In addition, some of the solodized-Chernozem probably finds its way in the "thin Black."

I am convinced the conductor was simply making conversation because we get into Winnipeg at 9:15 P. M., three hours late. My train has gone to St. Paul; no air line offices are open; and there are no hotel spaces available. I ask for the same space I had starting 24 hours later. I don't know what the chances are. The passenger agent arranges a berth for me in an old

Pullman in a switch-yard where all the trains go by.

I get to bed about 10:00 P. M. but the other occupants of the car talk and laugh until midnight so I read the life and works of Sarah Binks.

I am up at 8 o'clock after a surprisingly good sleep considering the circumstances. I go to the Fort Garry Hotel but not even a daytime room is to be had. I sit around all day writing, reading, and fixing my accounts.

About 7:00 P. M. I get a reservation on a train for St. Paul and leave at 7:30 P. M. I cross the border to the United States at 9:45 P. M. The train is jerky but the customs and immigration officers are very courteous.

University of Saskatchewan

Saskatoon, Saskatchewan

February 20, 1952.

DEPARTMENT OF SOILS

Dr. Charles E. Kellogg, Chief,
Division of Soil Survey,
Bureau of Plant Industry and Soils,
U.S.D.A.,
BELTSVILLE, Maryland, U.S.A.

Dear Kellogg:

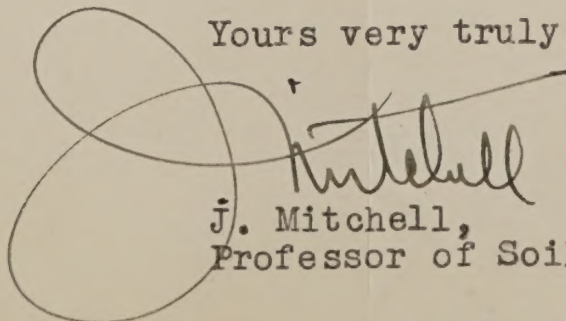
We are sending your journal on to Alberta for their perusal. I think it would be too bad if the Alberta people did not have the pleasure of reading your very full account of the trip and what you saw. I am sure Odynsky will be particularly interested in your remarks about the soils in the Peace River area.

I noticed one or two slight errors and thought I might call them to your attention:

Page 5 fertilizer was 11-48-0 ammonium phosphate.
Page 15 town name is Naicam.
Page 19 town name is Nipawin.
Page 29 Weirdale is east of Prince Albert.
Plate IX the people in the picture are Hutcheon to the left,
 Moss to the right and Janzen's behind in the middle.
Page 36 I think you have used chestnut where you meant to
 say chernozem.
Page 64 You have 15 miles west of Rocky Mountain House which
 I think should be east of Rocky.

I am still working away on the Soil Survey Manual but I must say that I seem to have very little criticism which I think would be of value and I presume that might be taken as a compliment to the author if I have done my reading properly.

Yours very truly,



J. Mitchell,
Professor of Soils.

JM/MB

Ministry of Agriculture

February 20, 1952

Dr. Charles E. Kellogg, Chief,
Division of Soil Survey,
Bureau of Plant Industry and Soils,
U.S.D.A.,
Beltsville, Maryland, U.S.A.

Dear Kellogg:

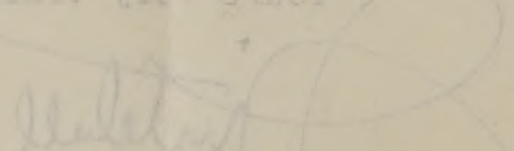
We are sending your journal on to Alberta for the
personal. I think it would be too bad if the Alberta people
did not have the pleasure of reading your very full account
of the trip and what you saw. I am sure they will be
particularly interested in your remarks about the soils in
the Peace River area.

I noticed one or two slight errors and thought I
might call them to your attention:

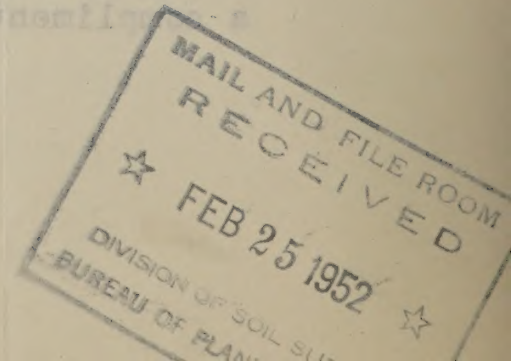
Page 2 Fertilizer was 11-45-0 ammonium phosphate.
Page 12 Your name is Nelson.
Page 19 Your name is Winwin.
Page 29 Fertilizer is west of Prince Albert.
Page IX The people in the picture are Johnson to the left,
Hose to the right and Jensen's picture in the middle.
Page 30 I think you have used chestnut where you meant to
say chestnut.
Page 64 You have 15 miles west of Rocky Mountain House and
I think should be west of Rocky.

I am still working away on the Soil Survey Manual
but I must say that I seem to have very little criticism and
I think would be of value and I presume that might be taken
in comment to the author if I have done my reading properly.

Yours very truly,



J. Macdonald,
Professor of Soils.



September 10

I arrive in Minneapolis 7:25 A. M. and get space on the train to Chicago which leaves about 8:00 A. M.

I arrive in Chicago at 2:00 P. M. and the passenger agent tells me that the B and O has a reservation for me.

I mail my kodachromes and get on the Capital Limited which leaves at 3:35.

September 11

Arrive in Silver Spring at 8:10 and I am glad
to be back home again.

For detailed statements of the soils of Saskatchewan
see, Soil Survey Report No. 12 of Southern Saskatchewan
(1944) and Report No. 13 of Agriculturally Settled Areas
North of Township 48 (1950) University of Saskatchewan.

